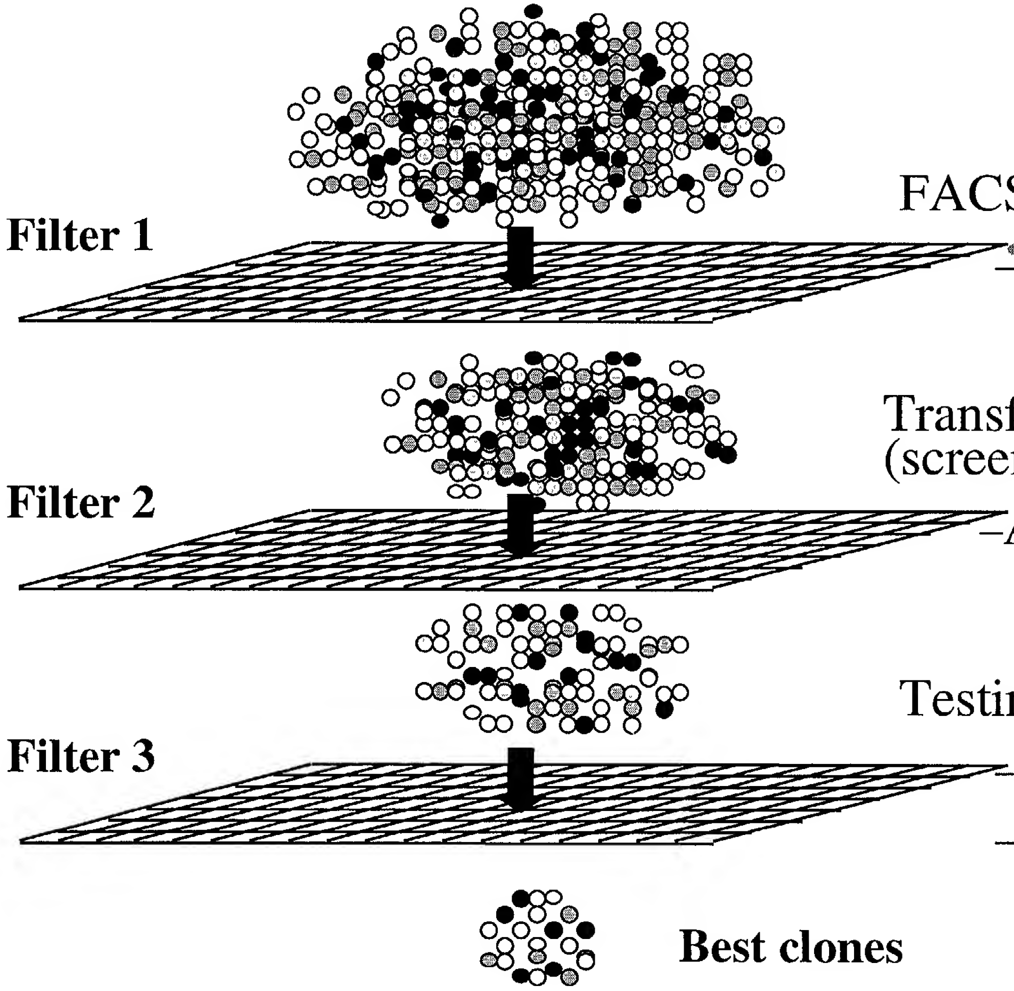
Figure 1: Screening libraries of chimeric promoter sequences



FACS sorting (screen 5x10^5)

–Enrichment for good promoters

Transfection and FACS analysis (screen 2000)

–Analysis of individual clones

Testing *in vivo* (screen 30)

–Transgene expression

–Ab production

Figure 2: Enrichment of chimeric promoter libraries by FACS sorting

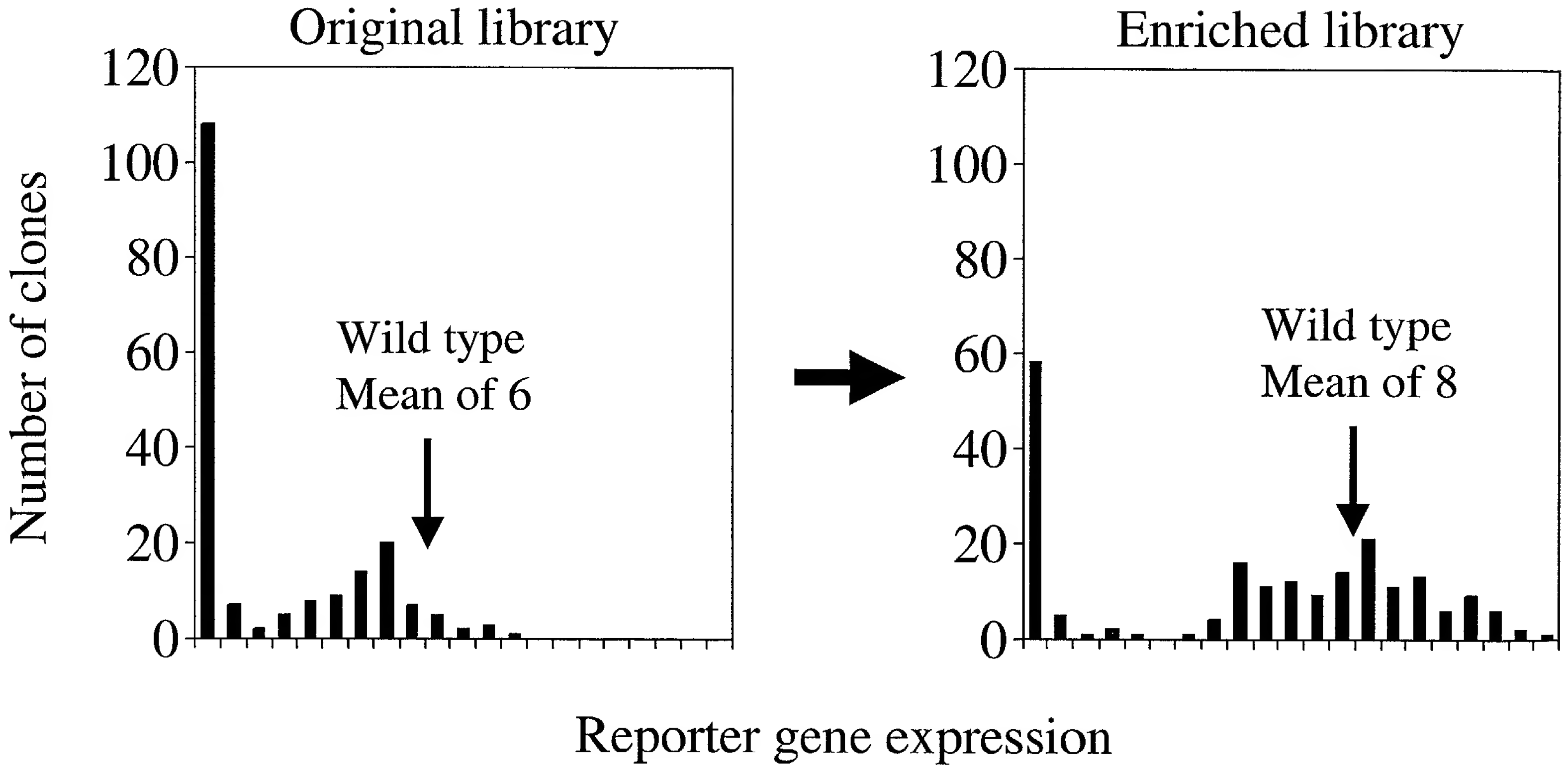


Figure 3: Diverse activities of chimeric promoter sequences in transfected cells

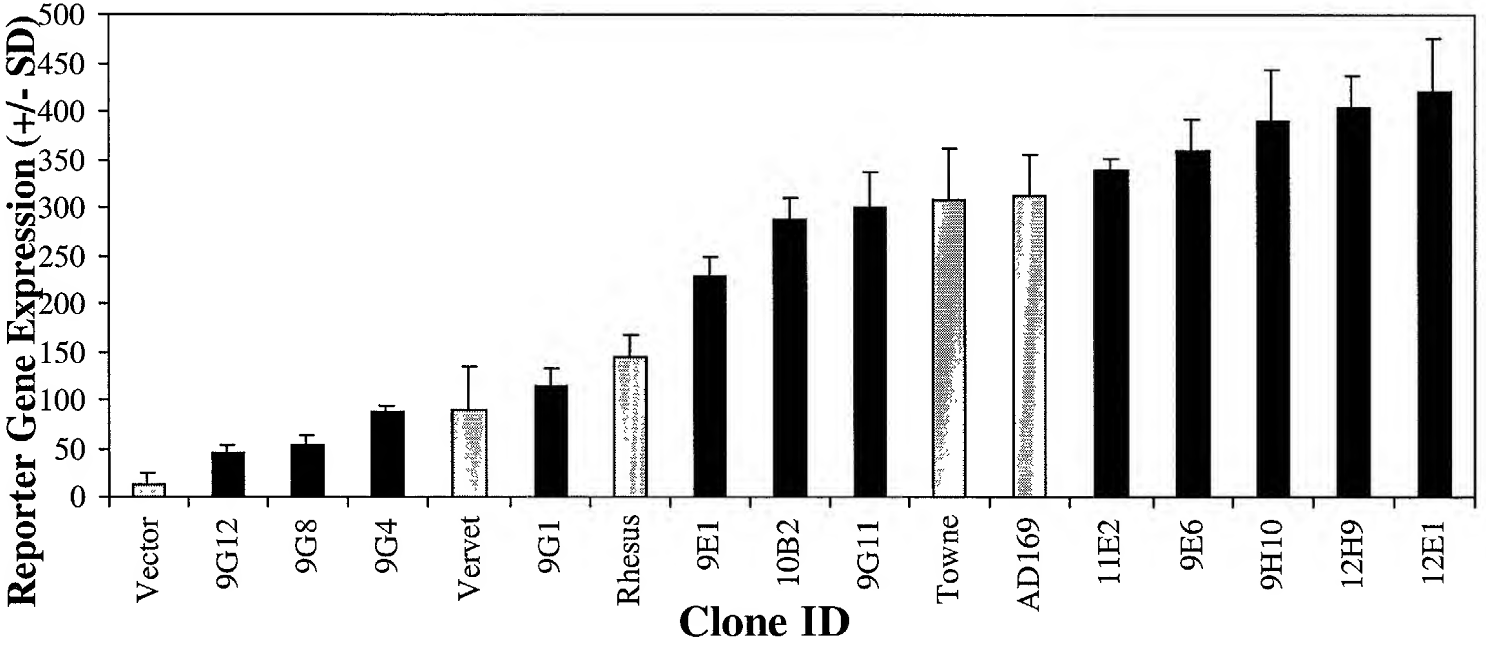


Figure 4: Luciferase expression in muscle 7 days after plasmid injection

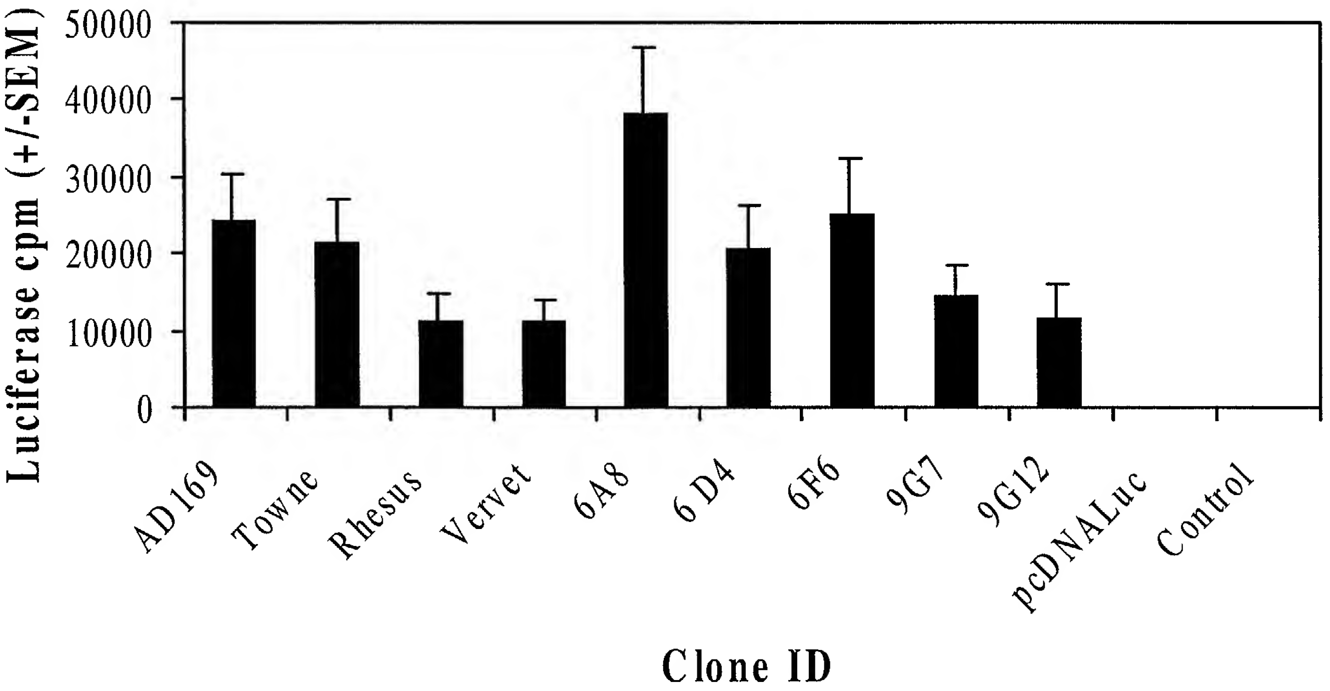


Figure 5: Comparison of Luciferase expression from clone 6A8 and parental clones

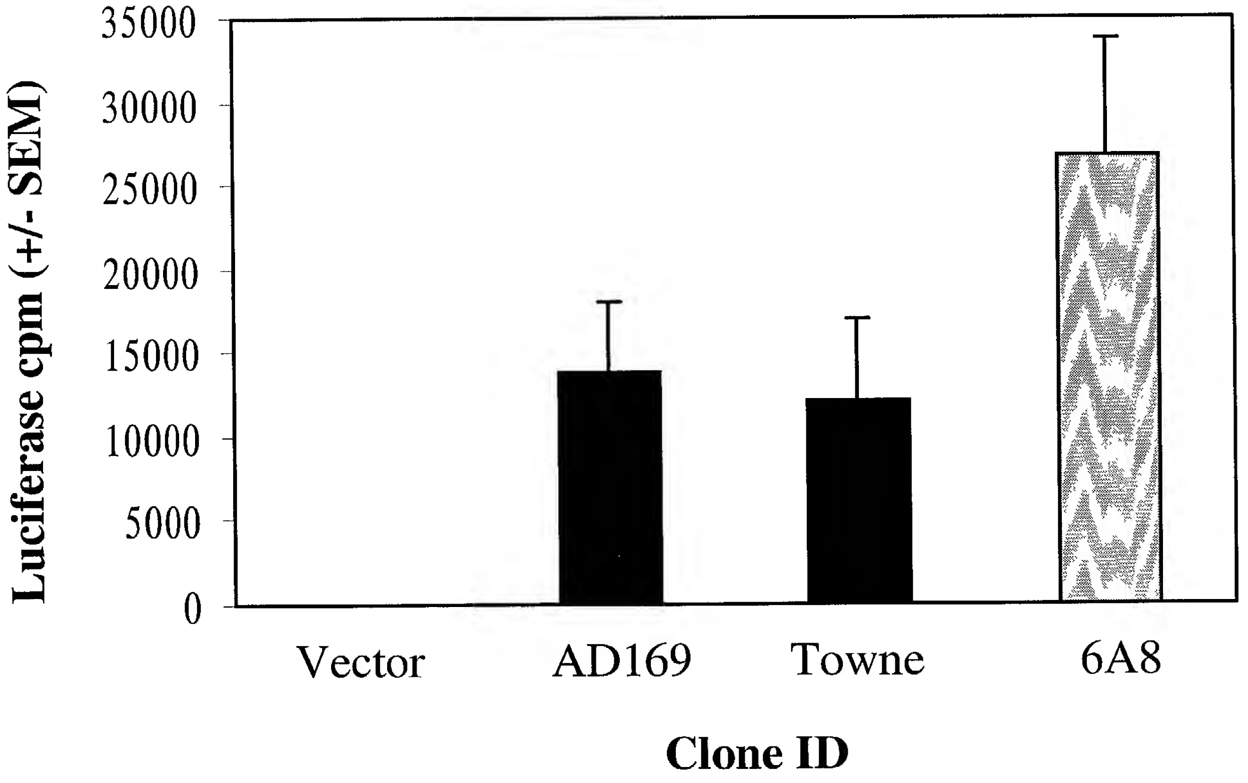


Figure 6A: Antibody responses following injection with β-galactosidase-encoding plasmid

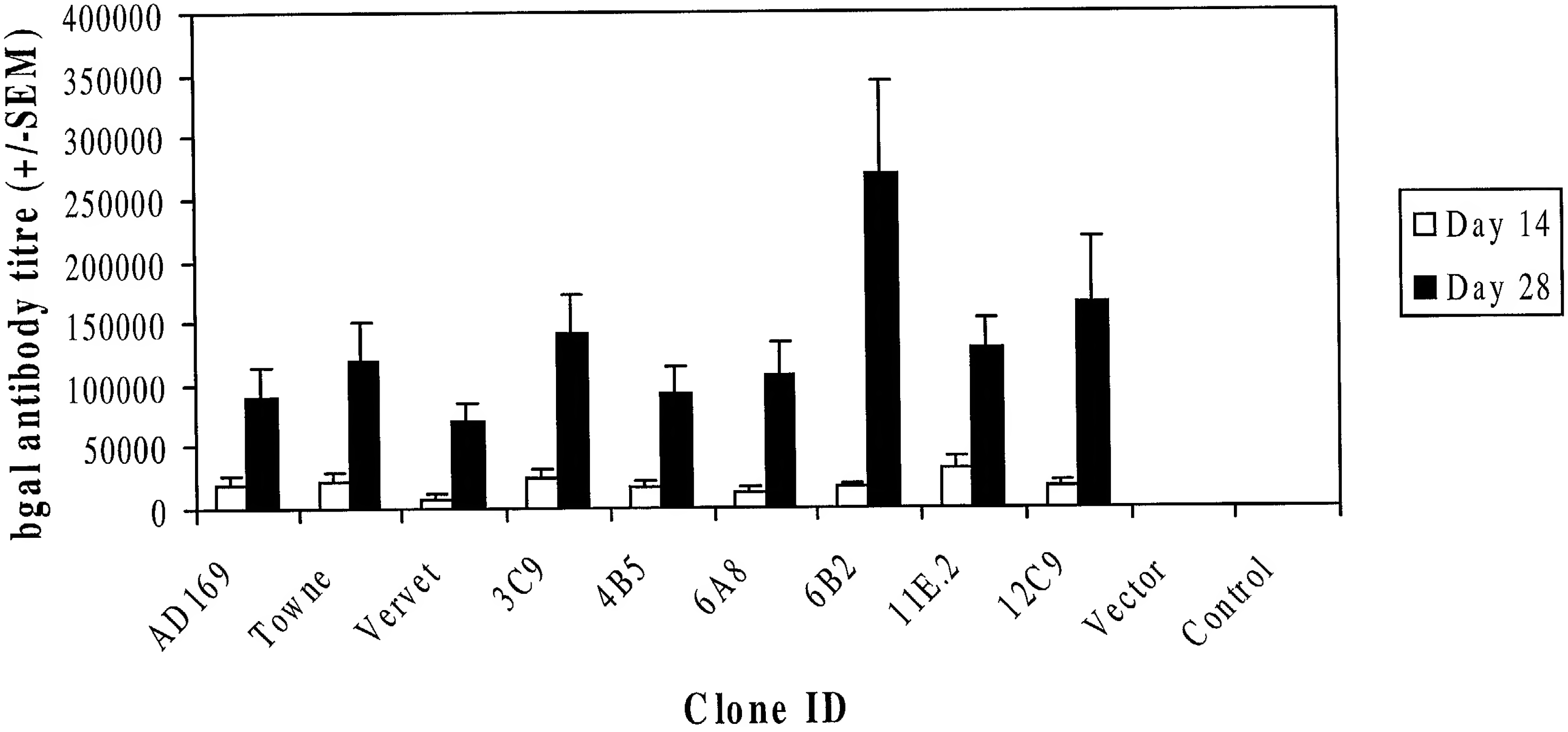


Figure 6B: Improved Ab Response by Shuffled Promoter

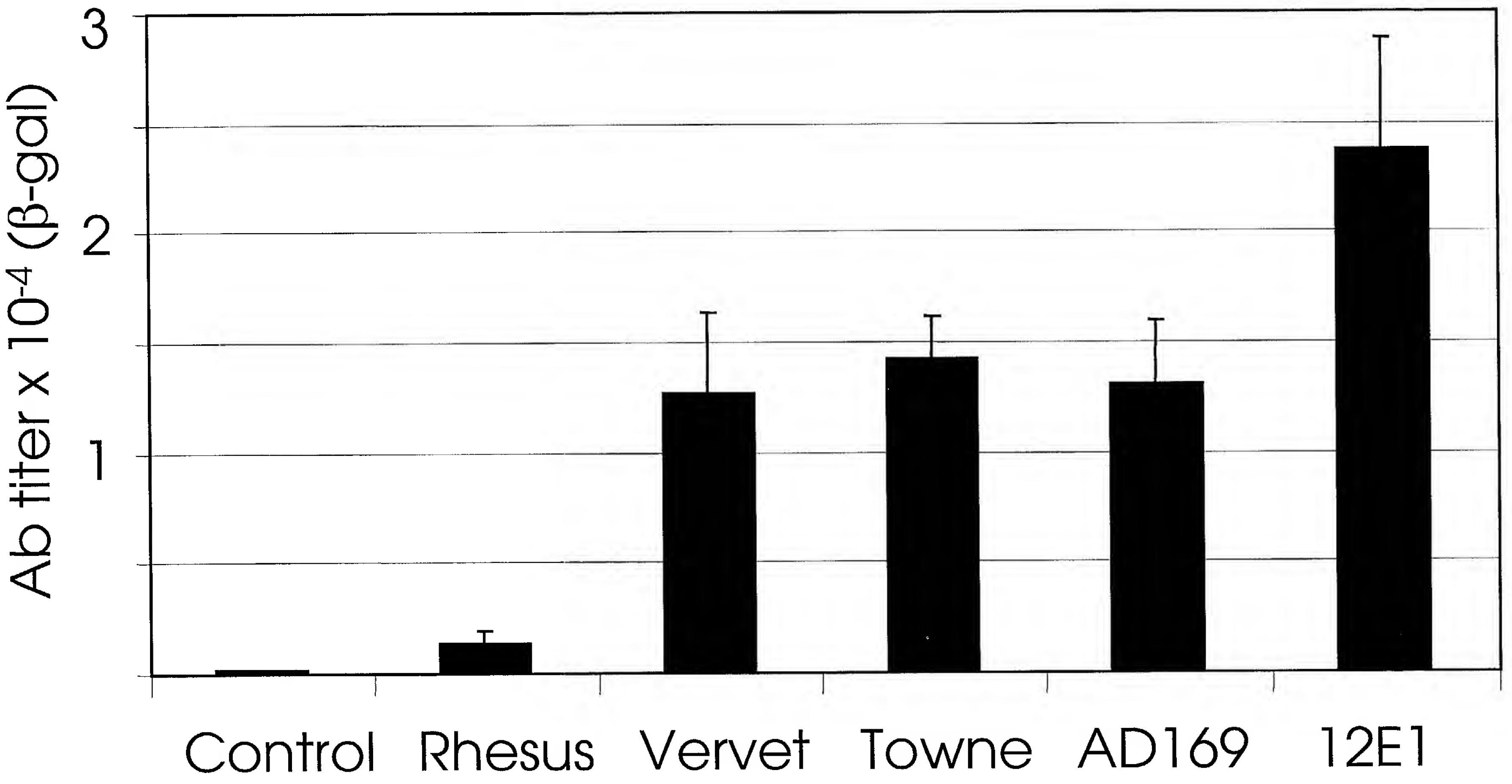


Figure 7: Chimeric promoter 6A8 is functional in human muscle tissue

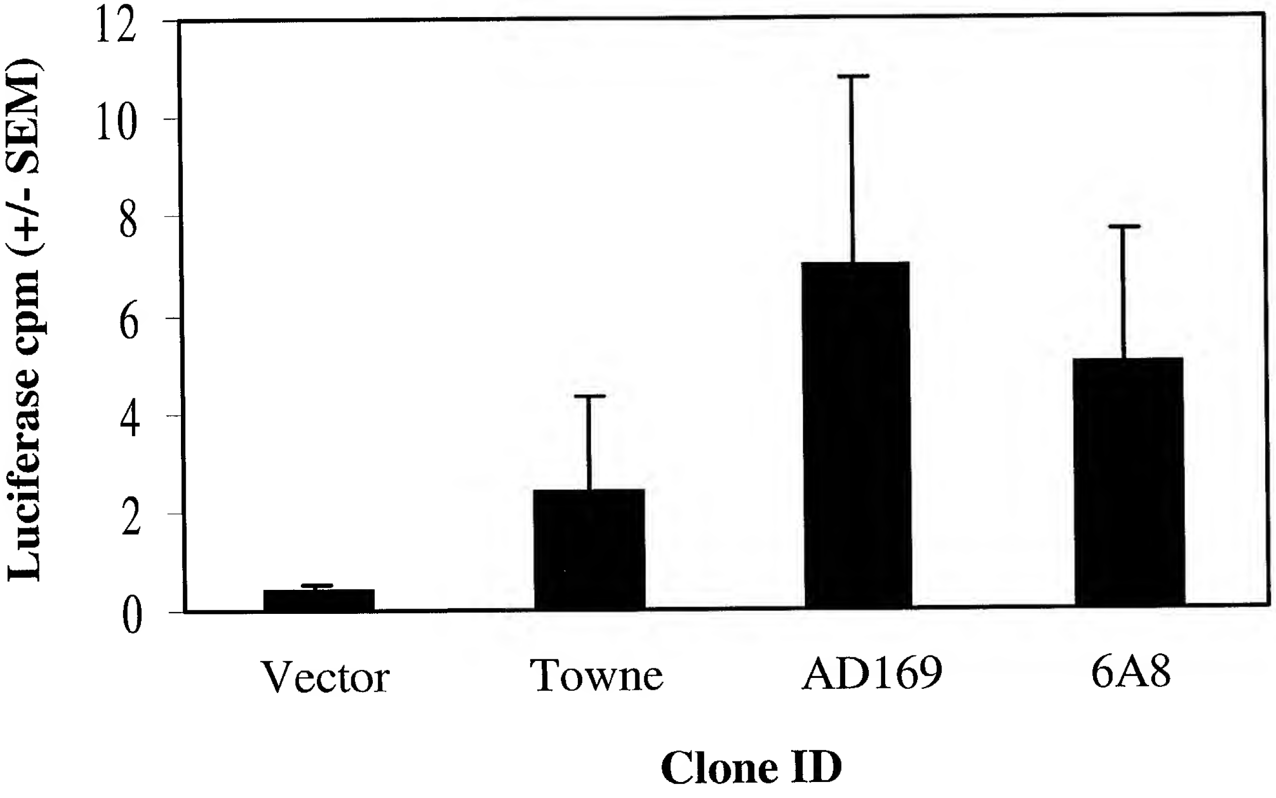


Figure 8A: Comparison of 18 chimeric promoter sequences generated by DNA shuffling using CMV promoter nucleic acid sequences from AD169 and Towne human strains and Rhesus and Vervet monkey strains as parental sequences.

```
                  1                                                                                                 100
     10B2   (1)   ATATGAGGCTATATCGCCGATAGAGGCGACATCAAGCTGGCACATGGCCAATGCATATCGATCTATACATTAAATCAATATTGGCAATTAGCCATATTTG
     11E2   (1)   ATATGAGGCTATATCGCCGATATAGGCGACATCAAGCTGGCACATAGCCAATGCATATCGATCTATACGTTGAATCAATATTGGCCATTAGCCATATTAT
     12C9   (1)   ATATGAGGCTATATCGCCGATAGAGGCGACATCAAGCTGGCACATGGCCAATGCATATCGATCTATACATTGAATCAATATTGGCCATTAGCCATATTAT
     12E1   (1)   ATATGAGGCTATATCGCCGATAGAGGCGACATCAAGCTGGCACATGGCCAATGCATATCGATCTATACATTGAATCAATATTGGCAATTAGCCATATTAG
     12H9   (1)   ATATGAGGCTATATCGCCGATAGAGGCGACATCAAGCTGGCACATGGCCAATGCATATCGATCTATACATTGAATCAATATTGGCCATTAGCCATATTAT
      3C9   (1)   ATATGAGGCTATATCGCCGATAGAGGCGACATCAAGCTGGCACATGGCCAATGCATATCGATCTATACATTGAATCAATATTGGCAATTAGCCATATTAG
      4B5   (1)   ATATGAGGCTATATCGCCGATAGAGGCGACATCAAGCTGGCACATGGCCAATGCATATCGATCTATACATTGAATCAATATTGGCAATTAGCCATATTAG
      6A8   (1)   ATATGAGGCTATATCGCCGATAGAGGCGACATCAAGCCGGCACATGGCCAATGCATATCGATCTATACATTGAATCAATATTGGCAATTAGCCATATTAT
      6B2   (1)   ATATGAGGCTATATCGCCGATATAGGCGACATCAAGCTGGCACATGGCCAATGCATATCGATCTATACATTGAATCAATATTGGCAATTAGCCATATTAG
      6D4   (1)   ATATGAGGCTATATCGCCGATAGAGACGACATCAAGCTGGCACATGGCCAATGCATATCGATCTATACATTGAATCAATATTGGCCATTAGCCATATTAT
      6F6   (1)   ATATGAGGCTATATCGCCGATATAGGCGACATCAAGCTGGCACATGGCCAATGCATATCGATCTATACGTTGAATCAATATTGGCCATTAGCCATATTAT
      9E1   (1)   ATATGAGGCTATATCGCCGATAGAGGCGACATCAAGCTGGCACATGGCCAATGCATATCGATCTATACATTGAATCAATATTGGCAATTAGCCATATTAG
     9F11   (1)   ATATGAGGCTATATCGCCGATAGAGGCGACATCAAGCCGGCACATGGCCAATGCATATCGATCCATACATTGAATCAATATTGGCCATTAGCCATATTAT
     9G11   (1)   ATATGAGGCTATATCGCCGATATAGGCGACATCAAGCTGGCACATGGCCAATGCATATCGATCTATACATTGAATCAATATTGGCAATTAGCCATATTAG
     9G12   (1)   ATATGAGGCTATATCGCCGATAGAGGCGACATCAAGCTGGCACATGGCCAATGCATATCGATCTATACATTGAATCAATATTAGCAATTAGCCATATTAG
      9G4   (1)   ATATGAGGCTATATCGCCGATATAGGCGACATCAAGCTGGCACATGGCCAATGCATATCGATCTATACATTGAATCAATATTGGCAATTAGCCATATTAG
      9G7   (1)   ATATGAGGCTATATCGCCGATAGAGGCGACATCAAGCTGGCACATGGCCAATGCATATCGATCTATACATTGAATCAATATTGGCAATTAGCCATATTAG
      9G8   (1)   ATATGAGGCTATATCGCCGATATAGGCGACATCAAGCTGGCACATGGCCAATGCATATCGATCTATACATTGAATCAATATTGGCAATTAGCCATATTAG
    AD169   (1)   ATATGAGGCTATATCGCCGATAGAGGCGACATCAAGCTGGCACATGGCCAATGCATATCGATCTATACATTGAATCAATATTGGCCATTAGCCATATTAT
    Towne   (1)   ATATGAGGCTATATCGCCGATAGAGGCGACATCAAGCTGGCACATGGCCAATGCATATCGATCTATACATTGAATCAATATTGGCAATTAGCCATATTAG
Consensus   (1)   ATATGAGGCTATATCGCCGATAGAGGCGACATCAAGCTGGCACATGGCCAATGCATATCGATCTATACATTGAATCAATATTGGCAATTAGCCATATTAG
                  101                                                                                               200
     10B2 (101)   TCATTGGTTATATAGCATAAATCAATATTGGCTATTGGCCATTGCATACGTTGTATCTATATCATAATATGTACATTTATATTGGCTCATGTCCAATACG
     11E2 (101)   TCATTGGTTATATAGCATAGATCAATATTGGCTATTGGCCATTGCATACGTTGTATCTATATCATAATATGTACATTTATATTGGCTCATGTCCAATATG
     12C9 (101)   TCATTGGTTATATAGCATAAATCAATATTGGCTATTGGCCATTGCATACGTTGTATCCATATCATAATATGTACATTTATATTGGCTCATGTCCAACATT
     12E1 (101)   TCATTGGTTATATAGCATAAATCAATATTGGCTATTGGCCATCGCATACGTTGTATCTATATCATAATATGTACATTTATATTGGCTCATGTCCAATATG
     12H9 (101)   TCATTGGTTATATAGCATAAATCAATATTGGCTATTGGCCACTGCATACGTTGTATCTATATCATAATATGTACATTTATATTGGCTCATGTCCAATATG
      3C9 (101)   TCATTGGTTATATAGCATAAATCAATATTGGCTATTGGCCATTGCATACGTTGTATCTATATCATAATATGTACATTTATATTGGCTCATGTCCAACATT
      4B5 (101)   TCATTGGTTATATAGCATAAATCAATATTGGCTATTGGCCATTGCATACGTTGTATCTATATCATAATATGTACATTTATATTGGCTCATGTCCAATATG
      6A8 (101)   TCATTGGTTATATAGCATAAATCAATATTGGCTATTGGCCATTGCATACGTTGTATCCGTATCATAATATGTACATTTATATTGGCCCATGTCCAATATG
      6B2 (101)   TCATTGGTTATATAGCATAAATCAATATCGGCTATTGGCCATTGCATACGTTGTATCTATATCATAATATGTACATTTATATTGGCTCATGTCCAATACG
      6D4 (101)   TCATTGGTTATATAGCATAAATCAATATTGGCTATTGGCCATTGCATACGTTGTATCTATATCATAATATGTACATTTATATTGGTTCATGTCCAATATG
      6F6 (101)   TCATTGGTTATATAGCATAAATCAATATTGGCTATTGGCCATTGCATACGTTGTATCCATATCATAATATGTACATTTATATTGGCTCATGTCCAATATG
      9E1 (101)   TCATTGGTTATATAGCATAAATCAATATTGGCTATTGGCCATTGCATACGTTGTATCTATATCATAATATGTACATTTATATTGGCTCATGTCCAACATT
     9F11 (101)   TCATTGGTTATATAGCATAAATCAATATTGGCTATTGGCCATTGCATACGTTGTATCCATATCATAATATGTACATTTATATTGGCTCATGTCCAATATG
     9G11 (101)   TCATTGGTTATATAGCATAAATCAATATTGGCTATTGGCCATTGCATACGTTGTATCTATATCATAATATGTACATTTATATTGGCTCATGTCCAATATG
     9G12 (101)   TCATTGGTTATATAGCGTAAATCAATATTGGCTATTGGCCATTGCATACGTTGTATCTATATCATAATATGTACATTTATATTGGCTCATGTCCAATATG
      9G4 (101)   TCATTGGTTATATAGCATAAATCAATATTGGCTATTGGCCATTGCATACGTTGTATCTATATCATAATATGTACATTTATATTGGCTCATGTCCAATATG
      9G7 (101)   TCATTGGTTATATAGCATAAATCAATATTGGCTATTGGCCATTGCATACGTTGTATCCATATCATAATATGCACATTTATATTGGCTCATGTCCAATATG
      9G8 (101)   TCATTGGTTATATAGCATAAATCAATATTGGCTATTGGCCATTGCATACGTTGTATCTATATCATAATATGTACATTTATATTGGCTCATGTCCAATATG
    AD169 (101)   TCATTGGTTATATAGCATAAATCAATATTGGCTATTGGCCATTGCATACGTTGTATCCATATCATAATATGTACATTTATATTGGCTCATGTCCAACATT
    Towne (101)   TCATTGGTTATATAGCATAAATCAATATTGGCTATTGGCCATTGCATACGTTGTATCTATATCATAATATGTACATTTATATTGGCTCATGTCCAATATG
Consensus (101)   TCATTGGTTATATAGCATAAATCAATATTGGCTATTGGCCATTGCATACGTTGTATCTATATCATAATATGTACATTTATATTGGCTCATGTCCAATATG
```

Figure 8B: Comparison of 18 chimeric promoter sequences generated by DNA shuffling using CMV promoter nucleic acid sequences from AD169 and Towne human strains and Rhesus and Vervet monkey strains as parental sequences.

```
                  201                                                                                                300
     10B2  (201)  ACCGCCATGTTGACATTGATTATTGACTAGTTATTAATAGTAATCAATTACGGGGTCATTAGTTCATAGCCCATATATGGAGTTCCGCGTTACATAACTT
     11E2  (201)  ACTGCCATGTTGACATTGATTATTGACTAGTTATTAATAGTAATCAATTACGGGGTCATTAGTTCATAGCCCATATATGGAGTTCCGCGTTACATAACTT
     12C9  (201)  ACCGCCATGTTGACATTGATTATTGACTAGTTATTAATAGTAATCAATTACGGGGTCATTAGTTCATAGCCCATATATGGAGTCCCGCGTTACATAACTT
     12E1  (201)  ACCGCCATGTTGACATTGATTATTGACTAGTTATTAATAGTAATCAATTACGGGGTCATTAGTTCATAGCCCATATATGGAGTTCCGCGTTACATAACTT
     12H9  (201)  ACCGCCATGTTGACATTGATTATTGACTAGTTATTAATAGTAATCAATTACGGGGTCATTAGTTCATAGCCCATATATGGAGTTCCGCGTTACATAACTT
      3C9  (201)  ACCGCCATGTTGACATTGATTATTGACTAGTTATTAATAGTAATCAATTACGGGGTCATTAGTTCATAGCCCATATATGGAGTTCCGCGTTACATAACTT
      4B5  (201)  ACCGCCATGTTGACATTGATTATTGACTAGTTATTAATAGTAATCAATTACGGGGTCATTAGTTCATAGCCCATATATGGAGTTCCGCGTTACATAGCTT
      6A8  (201)  ACCGCCATGTTGACATTGATTATTGACTAGTTATTAATAGTAATCAATTACGGGGTCATTAGTTCATAGCCCATATATGGAGTTCCGCGTTACATAACTT
      6B2  (201)  ACCGCCATGTTGACATTGATTATTGACTAGTTATTAATAGTAATCAATTACGGGGTCATTAGTTCATAGCCCATATATGGAGTTCCGCGTTACATAACTT
      6D4  (201)  ACCGCCATGCTGACATTGATTATTGACTAGTTATTAATAGTAATCAATTACGGGGTCATTAGTTCATAGCCCATATATGGAGTTCCGCGTTACATAACTT
      6F6  (201)  ACCGCCATGCTGACATTGATTATTGACTAGTTATTAACAGTAATCAATTACGGGGTCATCAGTTCATAGCCCATATATGGAGTTCCGCGTTACATAACTT
      9E1  (201)  ACCGCCATGTTGACATTGATTATTGACTAGTTATTAATAGTAATCAATTACGGGGTCATTAGTTCATAGCCCATATATGGAGTTCCGCGTTACATAACTT
     9F11  (201)  ACCGCCATGTTGACATTGATTATTGACTAGTTATTAATAGTAATCAATTACGGGGTCATTAGTTCATAGCCCATATATGGAGTTCCGCGTTACATAACTT
     9G11  (201)  ACCGCCATGTTGACATTGATTATTGACTAGTTATTAATAGTAATCAATTACGGGGTCATTAGTTCATAGCCCATATATGGAGTTCCGCGTTACATAACTT
     9G12  (201)  ACCGCCATGTTGACATTGATTATTGACTAGTTATTAATAGTAATCAATTACGGGGTCATTAGTTCATAGCCCATATATGGAGTTCCGCGTTACATAACTT
      9G4  (201)  ACCGCCATGTTGACATTGATTATTGACTAGTTATTAATAGTAATCAATTACGGGGTCATTAGTTCATAGCCCATATATGGAGTTCCGCGTTACATAACTT
      9G7  (201)  ACCGCCATGTTGACATTGATTATTGACTAGTTATTAATAGTAATCAATTACGGGGTCATTAGTTCATAGCCCATATATGGAGTTCCGCGTTACATAACTT
      9G8  (201)  ACCGCCATGTTGACATTGATTATTGACTAGTTATTAATAGTAATCAATTACGGGGTTATTAGTTCATAGCCCATATATGGAGTTCCGCGTTACATAACTT
    AD169  (201)  ACCGCCATGTTGACATTGATTATTGACTAGTTATTAATAGTAATCAATTACGGGGTCATTAGTTCATAGCCCATATATGGAGTTCCGCGTTACATAACTT
    Towne  (201)  ACCGCCATGTTGACATTGATTATTGACTAGTTATTAATAGTAATCAATTACGGGGTCATTAGTTCATAGCCCATATATGGAGTTCCGCGTTACATAACTT
Consensus  (201)  ACCGCCATGTTGACATTGATTATTGACTAGTTATTAATAGTAATCAATTACGGGGTCATTAGTTCATAGCCCATATATGGAGTTCCGCGTTACATAACTT
                  301                                                                                                400
     10B2  (301)  ACGGTAAATGGCCCGCCTGGCTGACCGCCCAACGACCCCCGCCCATTGACGTCAATAATGACGTATGTTCCCATAGTAACGCCAATAGGGACTTTCCATT
     11E2  (301)  ACGGTAAATGGCCCGCCTGGCTGACCGCCCAACGACCCCCGCCCATTGACGTCAATAATGACGTATGTTCCCATAGTAACGCCAATAGGGACTTTCCATT
     12C9  (301)  ACGGTAAATGGCCCGCCTGGCTGACCGCCCAACGACCCCCGCCCATTGACGTCAATAATGACGTATGTTCCCATAGTAACGCCAATAGGGACTTTCCATT
     12E1  (301)  ACGGTAAATGGCCCGCCTGGCTGACCGCCCAACGACCCCCGCCCATTGACGTCAATAGTGACGTATGTTCCCATAGTAACGCCAATAGGGACTTTCCATT
     12H9  (301)  ACGGTAAATGGCCCGCCTGGCTGACCGCCCAACGACCCCCGCCCATTGACGTCAATAATGACGTATGTCCCCATAGTAACGCCAATAGGGACTTTCCATT
      3C9  (301)  ACGGTAAATGGCCCGCCTGGCTGACCGCCCAACGACCCCCGCCCATTGACGTCAATAATGACGTATGTTCCCATAGTAACGCCAATAGGGACTTTCCATT
      4B5  (301)  ACGGTAAATGGCCCGCCTGGCTGACTGCCCAACGACCCCCGCCCATTGACGTCAATAACGACGTATGTTCCCATAGTAACGCCAATAGGGACTTTCCATT
      6A8  (301)  ACGGTAAATGGCCCGCCTGGCTGACCGCCCAACGACCCCCGCCCATTGACGTCAATAATGACGTATGTTCCCATAGTAACGCCAATAGGGACTTTCCATT
      6B2  (301)  ACGGTAAATGGCCCGCCTGGCTGACCGCCCAACGACCCCCGCCCATTGACGTCAATAATGACGTATGTTCCCATAGTAACGCCAATAGGGACTTTCCATT
      6D4  (301)  ACGGTAGATGGCCCGCCTGGCCGACCGCCCAACGACCCCCGCCCATTGACGTCAATAATGACGTATGTCCCCATAGTAACGCCAATAGGGACTTTCCATT
      6F6  (301)  ACGGTAAATGGCCCGCCTGGCTGACCGCCCAACGACCCCCGCCCATTGACGTCAATAATGACGTATGTTCCCATAGTAACGCCAATAGGGACTTTCCATT
      9E1  (301)  ACGGTAAATGGCCCGCCT----------------------------------------------------------------------------------
     9F11  (301)  ACGGTAGATGGCCCGCCTGGCTGACCGCCCAACGACCCCCGCCCATTGACGTCAATAATGACGTATGTTCCCATAGTAACGCCAATAGGGACTTTCCATT
     9G11  (301)  ACGGTAAATGGCCCGCCTGGCTGACCGCCCAACGACCCCCGCCCATTGACGTCAATAATGACGTATGTTCCCATAGTAACGCCAATAGGGACTTTCCATT
     9G12  (301)  ACGGTAAATGGCCCGCCTGGCTGACCGCCCAACGACCCCCGCCCATTGACGTCAATAATGACGTATGTTCCCATAGTAACGCCAATAGGGACTTTCCATT
      9G4  (301)  ACGGTAGATGGCCCGCCTGGCTGACCGCCCAACGACCCCCGCCCATTGACGTCAATAATGACGTATGTTCCCATAGTAACGCCAATAGGGACTTTCCATT
      9G7  (301)  ACGGTAAATGGCCCGCCTGGCTGACCGCCCAACGACCCCCACCCATTGACGTCAATAATGACGTATGTTCCCATAGTAACGCCAATAGGGACTTTCCATT
      9G8  (301)  ACGGTAAATGGCCTGCCTGGCTGACCGCCCAACGACCCCCGCCCATTGACGTCAATAATGACGTATGTTCCCATAGTAACGCCAATAGGGACTTTCCATT
    AD169  (301)  ACGGTAAATGGCCCGCCTGGCTGACCGCCCAACGACCCCCGCCCATTGACGTCAATAATGACGTATGTTCCCATAGTAACGCCAATAGGGACTTTCCATT
    Towne  (301)  ACGGTAAATGGCCCGCCTCG-TGACCGCCCAACGACCCCCGCCCATTGACGTCAATAATGACGTATGTTCCCATAGTAACGCCAATAGGGACTTTCCATT
Consensus  (301)  ACGGTAAATGGCCCGCCTGGCTGACCGCCCAACGACCCCCGCCCATTGACGTCAATAATGACGTATGTTCCCATAGTAACGCCAATAGGGACTTTCCATT
```

Figure 8C: Comparison of 18 chimeric promoter sequences generated by DNA shuffling using CMV promoter nucleic acid sequences from AD169 and Towne human strains and Rhesus and Vervet monkey strains as parental sequences.

```
                 401                                                                                                500
     10B2  (401) GACGTCAATGGGTGGAGTATTTACGGTAAACTGCCCACTTGGCAGTACATCAAGTGTATCATATGCCAAGTCCG-CCCCCTATTGACGTCAATGACGGTA
     11E2  (401) GACGTCAATGGGTGGAGTATTTACGGTAAACTGCTCACTTGGCAGTACATCAAGTGTATCATATGCCAAGTACG-CCCCCTATTGACGTCAATGACGGTA
     12C9  (401) GACGTCAATGGGTGGGGTATTTACGGTAAACTGCCCACTTGGCAGTACATCAAGTGTATCATATGCCAAGTCCG-CCCCCTATTGACGTCAATGACGGTA
     12E1  (401) GACGTCAATGGGTGGAGTATTTACGGTAAACTGCCCACTTGGCAGTACATCAAGTGTATCATATGCCAAGTCCG-CCCCCTATTGACGTCAATGACGGTA
     12H9  (401) GACGTCAATGGGTGGAGTATTTACGGTAAACTGCCCACTTGGCAGTACATCAGGTGTATCATATGCCAAGTACG-CCCCCTATTGACGTCAATGACGGTA
      3C9  (401) GACGTCAATGGGTGGAGTATTTACGGTAAACTGCCCACTTGGCAGTACATCAAGTGTATCATATGCCAAGTCCGCCCCCCTATTGACGTCAATGACGGTA
      4B5  (401) GACGTCAATGGGTGGAGTATTTACGGTAAACTGCCCACTTGGCAGTACATCAAGTGTATCATATGCCAAGTACG-CCCCCTATTGACGTCAATGACGGTA
      6A8  (401) GACGTCAATGGGTGGAGTATTTACGGTAAACTGCCCACTTGGCAGTACATCAAGTGTATCATATGCCAAGTCCG-CCCCCTATTGACGTCAATGACGGTA
      6B2  (401) GACGTCAATGGGTGGAGTATTTACGGTAAACTGCCCACTTGGCAGTACATCAAGTGTATCATATGCCAAGTCCG-CCCCCTATTGACGTCAATGACGGTA
      6D4  (401) GACGTCAATGGGTGGAGTATTTACGGTAAACTGCCCACTTGGCAGTACATCAAGTGTATCATATGCCAAGTACG-CCCCCTATTGACGTCAATGACGGTA
      6F6  (401) GACGTCGATGGGTGGAGTATTTACGGTAAACTGCCCACTTGGCAGTACATCAAGTGTATCATATGCCAAGTCCG-CCCCCTATTGACGTCAATGACGGTA
      9E1  (319) ----------------------------------------------------------------------------------------------------
     9F11  (401) GACGTCAATGGGTGGAGTATTTACGGTAAACTGCCCACTTGGCAGTACATCAAGTGTATCATATGCCAAGTCCG-CCCCCTATTGACGTCAATGACGGTA
     9G11  (401) GACGTCAATGGGTGGAGTATTTACGGTAAACTGCCCACTTGGCAGTACGTCAAGTGTATCATATGCCAAGTCCG-CCCCCTATTGACGTCAATGACGGTA
     9G12  (401) GACGTCAATGGGTGGAGTATTTACGGTAAACTGCCCACTTGGCAGTACATCAAGTGTATCATATGCCAAGTCCG-CCCCCTATTGACGTCAATGACGGTA
      9G4  (401) GACGTCAATGGGTGGAGTATTTACGGTAAACTGCCCACTTGGCAGTACATCAAGTGTATCATATGCCAAGTCCG-CCCCCTATTGACGTCAATGACGGTA
      9G7  (401) GACGTCAATGGGTGGAGTATTTACGGTAAACTGCCCACTTGGCAGTACATCAAGTGTATCATATGTCAAGTCCG-CCCCCTATTGACGCCAATGACGGTA
      9G8  (401) GACGTCAATGGGTGGAGTATTTACGGTAAACTGCCCACTTGGCAGTACATCAAGTGTATCATATGCCAAGTACG-CCCCCTATTGACGTCAATGACGGTA
    AD169  (401) GACGTCAATGGGTGGAGTATTTACGGTAAACTGCCCACTTGGCAGTACATCAAGTGTATCATATGCCAAGTACGCCCCC-TATTGACGTCAATGACGGTA
    Towne  (400) GACGTCAATGGGTGGAGTATTTACGGTAAACTGCCCACTTGGCAGTACATCAAGTGTATCATATGCCAAGTCCGGCCCCCTATTGACGTCAATGACGGTA
Consensus  (401) GACGTCAATGGGTGGAGTATTTACGGTAAACTGCCCACTTGGCAGTACATCAAGTGTATCATATGCCAAGTCCG CCCCCTATTGACGTCAATGACGGTA
                 501                                                                                                600
     10B2  (500) AATGGCCCGCCTGGCATTATGCCCAGTACATGACCTTACGGGGCTTTCCTACTTGGCAGTACATCTACGTATTAGTCATCGCTATTACCATGGTGATGCG
     11E2  (500) AATGGCCCGCCTGGCATTATGCCCAGTACATGACCTTACGGGACTTTCCTACTTGGTAGTACATCTACGTATTAGTCATCGCTATTACCATGGTGATGCG
     12C9  (500) AATGGCCCGCCTGGCATTATGCCCAGTACATGACCTTACGGGACTTTCCTACTTGGCAGTACATCTACGTATTAGTCATCGCTATTACCATGGTGATGCG
     12E1  (500) AATGGCCCGCCTGGCATTATGCCCAGTACATGACCTTACGGGACTTTCCTACTTGGCAGTACATCTACGTATTAGTCATCGCTATTACCATGGTGATGCG
     12H9  (500) AATGGCCCGCCTGGCATTATGCCCAGTACATGACCTTACGGGACTTTCCTACTTGGCAGTACATCTACGTATTAGTCATCGCTATTACCATGGTGATGCG
      3C9  (501) AATGGCCCGCCTGGCATTATGCCCAGTACATGACCTTACGGGACTTTCCTACTTGGCAGTACATCTACGTATTAGTCATCGCTATTACCATGGTGATGCG
      4B5  (500) AATGGCCCGCCTGGCATTATGCCCAGTACATGACCTTACGGGACTTTCCTACTTGGCAGTACATCTACGTATTAGTCATCGCTATTACCATGGTGATGCG
      6A8  (500) AATGGCCCGCCTGGCATTATGCCCAGTACATGACCTTACGGGACTTTCCTACTTGGCAGTACATCTACGTATTAGTCATCGCTATTACCATGGTGATGCG
      6B2  (500) AATGGCCCGCCTGGCATTATGCCCAGTACATGGCCTTACGGGACTTTCCTACTTGGCAGTACATCTACGTATTAGTCATCGCTATTACCATGGTGATGCG
      6D4  (500) AATGGCCCGCCTGGCATTATGCCCAGTACATGACCTTACGGGACTTTCCTACTTGGCAGTACATCTACGTATTAGTCATCGCTATTACCATGGTGATGCG
      6F6  (500) AATGGCCCGCCTGGCATTATGCCCAGTACATGACCTTACGGGACTTTCCTACTTGGCAGTACATCTACGTATTAGTCATCGCTGTTACCATGGTGATGCG
      9E1  (319) ------------GGCATTATGCCCAGTACATGACCTTACGGGACTTTCCTACTTGGCAGTACATCTACGTATTAGTCATCGCTATTACCATGGTGATGCG
     9F11  (500) AATGGCCCGCCTGGCATTATGCCCAGTACATGACCTTACGGGACTTTCCTACTTGGCAGTACATCTACGTATTAGTCATCGCTATTACCATGGTGATGCG
     9G11  (500) AATGGCCCGCCTGGCATTATGCCCAGTACATGACCTTACGGGACTTTCCTACTTGGCAGTACATCTACGTATTAGTCATCGCTATTACCATGGTGATGCG
     9G12  (500) AATGGCCCGCCTGGCATTATGCCCAGTACATGACCTTACGGGACTTTCCTACTTGGCAGTACATCTGCGTATTAGTCATCGCTATTACCATGGTGATGCG
      9G4  (500) AATGGCCCGCCTGGCATTATGCCCAGTACATGACCTTACGGGACTTTCCTACTTGGCAGTACATCTACGTATTAGTCATCGCTATTACCATGGTGATGCG
      9G7  (500) AATGGCCCGCCTGGCATTATGCCCAGTACATGACCTTACGGGACTTTCCTACTTGGCAGTACATCTACGTATTAGTCATCGCTATTACCATGGTGATGCG
      9G8  (500) AATGGCCCGCCTGGCATTATGCCCAGTACATGACCTTACGGGACTTTCCTACTTGGCAGTACATCTACGTATTAGTCATCGCTATTACCATGGTGATGCG
    AD169  (500) AATGGCCCGCCTGGCATTATGCCCAGTACATGACCTTATGGGACTTTCCTACTTGGCAGTACATCTACGTATTAGTCATCGCTATTACCATGGTGATGCG
    Towne  (500) AATGGCCCGCCTGGCATTATGCCCAGTACATGACCTTACGGGACTTTCCTACTTGGCAGTACATCTACGTATTAGTCATCGCTATTACCATGGTGATGCG
Consensus  (501) AATGGCCCGCCTGGCATTATGCCCAGTACATGACCTTACGGGACTTTCCTACTTGGCAGTACATCTACGTATTAGTCATCGCTATTACCATGGTGATGCG
```

Figure 8D: Comparison of 18 chimeric promoter sequences generated by DNA shuffling using CMV promoter nucleic acid sequences from AD169 and Towne human strains and Rhesus and Vervet monkey strains as parental sequences.

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                  601                                                                                              700
     10B2   (600) GTTTTGGCAGTACACCAATGGGCGTGGATAGCGGTTTGACTCACGGGGATTTCCAAGTCTCCACCCCATTGACGTCAATGGGAGTTTGTTTTGGCACCAA
     11E2   (600) GTTTTGGCAGTACACCAATGGGCGTGGATAGCGGTTTGACTCACGGGGATTTCCAAGTCTCCACCCTATTGACGTCAATGGGAGTTTGTTTTGGCACCAA
     12C9   (600) GTTTTGGCAGTACACCAATGGGCGTGGATAGCGGTTTGACTCACGGGGATTTCCAAGTCTCCACCCTATTGACGTCAATGGGAGTTTGTTTTGGCACCAA
     12E1   (600) GTTTTGGCAGTACACCAATGGGCGTGGATAGCGGTTTGACTCACGGGGATTTCCAAGTCTCCACCCCATTGACGTCAATGGGG-----------------
     12H9   (600) GTTTTGGCAGTACACCAATGGGCGTGGATAGCGGTTTGACTCACGGGGATTTCCAAGTCTCCACCCCATTGACGTCAATGGGAGTTTGTTTTGGCACCAA
      3C9   (601) GTTTTGGCGGTACATCAATGGGCGTGGATAGCGGTTTGACTCACGGGGATTTCCAAGTCTCCACCCTATTGACGTCAATGGGAGTTTGTTTTGGCACCAA
      4B5   (600) GTTTTGGCAGTACATCAATGGGCGTGGATAGCAGTTTGACTCACGGGGATTTCCAAGTCTCCACCCCATTGACGTCAATGGGG-----------------
      6A8   (600) GTTTTGGCAGTACATCAATGGGCGTGGATAGCGGTTTGACTCACGGGGATTTCCAAGTCTCCACCCCATTGACGTCAATGGGAGTTTGTTTTGGCACCAA
      6B2   (600) GTTTTGGCAGTACACCAATGGGCGTGGATAGCGGTTTGACTCACGGGGATTTCCAAGTCTCCACCCCATTGACGTCAATGGGG-----------------
      6D4   (600) GTTTTGGCAGTACATCAATGGGCGTGGATAGCGGTTTGACTCACGGGGATTTCCAAGTCTCCACCCCATTGACGTCAATGGGG-----------------
      6F6   (600) GTTTTGGCAGTACACCAATGGGCGTGGATAGCGGTTTGACTCACGGGGATTTCCAAGTCTCCACCCCATTGACGTCAATGGGAGTTTGTTTTGGCACCAA
      9E1   (407) GTTTTGGCAGTACACCAATGGGCGTGGATAGCGGTTTGACTCACGGGGATTTCCAAGTCTCCACCCCATTGACGTCAATGGGAGTTTGTTTTGGCACCAA
     9F11   (600) GTTTTGGCAGTACATCAATGGGCGTAGATAGCGGTTTGACTCACGGGGATTTCCAAGTCTCCACCCCATTGACGTCAATGGGAGTTTGTCTTGGCACCAA
     9G11   (600) GTTTAGGCAGTACACCAATGGGCGTGGATAGCGGTTTGACTCACGGGGATTTCCAAGTCTCCACCCCATTGACGTCAATGGGAGTTTGTTTTGGCACCAA
     9G12   (600) GTTTTGGCAGTACACCAATGGGCGTGGATAGCGGTTTGACTCACGGGGATTTCCAAGTCTCCACCCCATTGACGTCAATGGGAGTTTGTTTTGGCACCAA
      9G4   (600) GTTTTGGCGGTACATCAATGGGCGTAGATAGCGGTTTGACTCACGGGGATTTCCAAGTCTCCACCCCATTGACGTCAATGGGAGTTTGTTTTGGCACCAA
      9G7   (600) GTTTTGGCAGTACACCAATGGGCGTGGATAGCGGTTTGACTCACGGGGATTTCCAAGTCTCCACCCCATTGACGTCAATGGGAGTTTGTTTTGGCACCAA
      9G8   (600) GTTTTGGCAGTACACCAATGGGCGTGGATAGCGGTTTGACTCACGGGGATTTCCAAGTCTCCACCCCATTGACGTCAATGGGAGTTTGTTTTGGCACCAA
    AD169   (600) GTTTTGGCAGTACATCAATGGGCGTGGATAGCGGTTTGACTCACGGGGATTTCCAAGTCTCCACCCCATTGACGTCAATGGGAGTTTGTTTTGGCACCAA
    Towne   (600) GTTTTGGCAGTACACCAATGGGCGTGGATAGCGGTTTGACTCACGGGGATTTCCAAGTCTCCACCCCATTGACGTCAATGGGAGTTTGTTTTGGCACCAA
Consensus   (601) GTTTTGGCAGTACACCAATGGGCGTGGATAGCGGTTTGACTCACGGGGATTTCCAAGTCTCCACCCCATTGACGTCAATGGGAGTTTGTTTTGGCACCAA
                  701                                                                                              800
     10B2   (700) AATCAACGGGACCTTCCAAAATGTCGTAATAACCCCGCCCCGTTGACGCAAATGGGCGGTAGGCGTGTACGGTGGGAGGTCTATATAAGCAATGCTCGTT
     11E2   (700) AATCAACGGGACTTTCCAAAATGTCGTAATAACCCCGCCCCGTTGACGCAAATGGGCGGTAGGCGTGTACGGTGGGAGGTCTATATAAGCAGAGCTCGTT
     12C9   (700) AATCAACGGGACTTTCCAAAATGTCGTAATAACTCCGCCCCGTCGACGCAAATGGGCGGTAGGCGTGTACGGTGGGAGGTCTATATAAGCAATGCTCGTT
     12E1   (683) -----------------------------------CGGTCCTATGACGCAAATGGGCGGTAGGCGTGTACGGTGGGAGGTCTATATAAGCAGAGCTCGTT
     12H9   (700) AATCAACGGGACTTTCCAAAATGTCGTAATAACCCCGCCCCGTTGACGCAAATGGGCGGTAGGCGTGTACGGTGGGAGGTCTATATAAGCAGAGCTCGTT
      3C9   (701) AATCAACGGGACTTTCCAAAATGTCGTAATAACCCCGCCCCGTTGACGCAAATGGGCGGTAGGCGTGTACGGTGGGAGGTCTATATAAGCAGAGCTCGTT
      4B5   (683) -----------------------------------CGGTCCTATGACGCAAATGGGCGGTAGGCGTGTACGGTGGGAGGTCTATATAAGCAGAGCTCGTT
      6A8   (700) AATCAACGGGACTTTCCAAAATGTCGTAATAACCCCGCCCCGTTGACGCAAATGGGCGGTAGGCGTGTACGGTGGGAGGTCTATATAAGCAGAGCTCGTT
      6B2   (683) -----------------------------------CGGTCCTATGACGCAAATGGGCGGTAGGCGTGTACGGTGGGAGGTCTATATAAGCAGAGCTCGTT
      6D4   (683) -----------------------------------CGGTCCTATGACGCAAATGGGCGGTAGGCGTGTACGGTGGGAGGTCTATATAAGCAGAGCTCGTT
      6F6   (700) AATCAACGGGACTTTCCAAAATGTCGTAATAACCCCGCCCCGTTGACGCAAATGGGCGGTAGGCGTGTACGGTGGGAGGTCTATATAAGCAGAGCTCGTT
      9E1   (507) AATCAACGGGACTTTCCAAAATGTCGTAATAACCCCGCCCCGTTGACGCAAATGGGCGGTAGGCGTGTACGGTGGGAGGTCTATATAAGCAGAGCTCGTT
     9F11   (700) AATCAACGGGACTTTCCAAAATGTCGTAATAACCCCGCCC-GTTGACGCAAATGGGCGGTAGGCGTGTACGGTGGGAGGTCTATATAAGCAGAGCTCGTT
     9G11   (700) AATCAACGGGACTTTCCAAAATGTCGTAATAACCCCGCCCCGTTGACGCAAATGGGCGGTAGGCGTGTACGGTGGGAGGTCTATATAAGCAGAGCTCGTT
     9G12   (700) AATCAACGGGACTTTCCAAAATGTCGTAATAACCCCGCCCCGTTGACGCAAATGGGCGGTAGGCGTGTACGGTGGGAGGTCTATATAAGCAGAGCTCGTT
      9G4   (700) AATCAACGGGACCTTCCAAAATGTCGTAATAACCCCGCCCCGTTGACGCAAATGGGCGGTAGGCGTGTACGGTGGGAGGTCTATATAAGCAGAGCTCGTT
      9G7   (700) AGTCAACGGGACTTTCCAAAATGTCGTAATAACCCCGCCCCGTTGACGCAAATGGGCGGTAGGCGTGTACGGTGGGAGGTCTATATAAGCAGAGCTCGTT
      9G8   (700) AATCAACGGGACTTTCCAAAATGTCGTAATAACCCCGCCCCGTTGACGCAAATGGGCGGTAGGCGTGTACGGTGGGAGGTCTATATAAGCAGAGCTCGTT
    AD169   (700) AATCAACGGGACTTTCCAAAATGTCGTAACAACTCCGCCCCATTGACGCAAATGGGCGGTAGGCGTGTACGGTGG-AGGTCTATATAAGCAGAGCTCGTT
    Towne   (700) AATCAACGGGACTTTCCAAAATGTCGTAATAACCCCGCCCCGTTGACGCAAATGGGCGGTAGGCGTGTACGGTGGGAGGTCTATATAAGCAGAGCTCGTT
Consensus   (701) AATCAACGGGACTTTCCAAAATGTCGTAATAACCCCGCCCCGTTGACGCAAATGGGCGGTAGGCGTGTACGGTGGGAGGTCTATATAAGCAGAGCTCGTT
```

Figure 8E: Comparison of 18 chimeric promoter sequences generated by DNA shuffling using CMV promoter nucleic acid sequences from AD169 and Towne human strains and Rhesus and Vervet monkey strains as parental sequences.

```
                 801                                                                                              900
     10B2  (800) TAGTGAACCGTCAGATCGCCTGGAGACGCCATCCACGCTGTTTTGACCTCCAT-AGAAGACACCGGGACCGATCCAGCCTCCGCGGCCGGGAACGGTGCA
     11E2  (800) TAGGGAACCGCCATTCTGCCTGGGGACGC------CGGAG----GAGCTCCATTGGAAGAGACCGGGACCGATCCAGCCTCCGCGGCCGGGAACGGTGCA
     12C9  (800) TAGGGAACCGCCATTCTGCCTGGGGACGC------CGGAG----GAGCACCAT-AGAAGACACCGGGACCGATCCAGCCTCCATAGCCGGGGACGGTGCA
     12E1  (748) TAGTGAACCGTCAGATCGCCTGGAGACGCCATCCACGCTGTTTTGACCTCCAT-AGAAGACACCGGGACCGATCCAGCCTCCGCGGCCGGGAACGGTGCA
     12H9  (800) TAGTGAACCGTCAGATCGCCTGGAGACGCCATCCACGCTGTTTTGACCTCCAT-AGAAGACACCGGGACCGATCCAGCCTCCGCGGCCGGGAACGGTGCA
      3C9  (801) TAGTGAACCGTCAGATCGCCTGGAGACGCCATCCACGCTGTTTTGACCTCCAT-AGAAGACACCGGGACCGATCCAGCCTCCGCGGCCGGGAACGGTGCA
      4B5  (748) TAGTGAACCGTCAGATCGCCTGGAGACGCCATCCACGCTGTTTTGACCTCCAT-AGAAGACACCGGGACCGATCCAGCCTCCGCGGCCGGGAACGGTGCA
      6A8  (800) TAGTGAACCGTCAGATCGCCTGGAGACGCCATCCACGCTGTTTTGACCTCCAT-AGAAGACACCGGGACCGATCCAGCCTCCGCGGCCGGGAACGGTGCA
      6B2  (748) TAGTGAACCGTCAGATCGCCTGGAGACGCCATCCACGCTGTTTTGACCTCCAT-AGAAGACACCGGGACCGATCCAGCCTCCGCGGCCGGGAACGGTGCA
      6D4  (748) TAGTGAACCGTCAGATCGCCTGGAGACGCCATCCACGCTGTTTTGACCTCCAT-AGAAGACACCGGGACCGATCCAGCCTCCGCGGCCGGGAACGGTGCA
      6F6  (800) TAGTGAACCGCCATTCTGCCTGGGGACGT------CGGAG----GAGCACCAT-AGAAGGTACCGGGACCGATCCAGCCTCCATAGCCGGGAACGGTGCA
      9E1  (607) TAGTGAACCGTCAGATCGCCTGGAGACGCCATCCACGCTGTTTTGACCTCCAT-AGAAGACACCGGGACCGATCCAGCCTCCGCGGCCGGGAACGGTGCA
     9F11  (799) TAGTGAACCGTCAGATCGCCTGGAGACGCCATCCACGCTGTTTTGACCTCCAT-AGAAGACACCGGGACCGATCCAGCCTCCGCGGCCGGGAACGGTGCA
     9G11  (800) TAGTGAACCGTCAGATCGCCTGGAGACGCCATCCACGCTGTTTTGACCTCCAT-AGAAGACACCGGGACCGATCCAGCCTCCATAGCCGGGAACGGTGCA
     9G12  (800) TAGTGAACCGTCAGATCGCCTGGAGACGCCATCCACGCTGTTTTGACCTCCAT-GGAAGACACCGGGACCGATCCAGCCTCCGCGGCCGGGAACGGTGCA
      9G4  (800) TAGTGAACCGTCAGATCGCCTGGAGACGCCATCCACGCTGTTTTGACCTCCAT-AGAAGACACCGGGACCGATCCAGCCTCCGCGGCCGGGAACGGTGCA
      9G7  (800) TAGGGAACCGTCATTCTGCCTGGGGACG------TCGGAG----GAGCACCAT-AGAAGGTACCGGGACCGATCCAGCCTCCGCGGCCGGGAACGGTGCA
      9G8  (800) TAGTGAACCGTCAGATCGCCTGGAGACGCCATCCACGCTGTTTTGACCTCCAT-GGAAGACACCGGGACCGATCCAGCCTCCATAGCCGGGGACGGTGCA
    AD169  (799) TAGTGAACCGTCAGATCGCCTGGAGACGCCATCCACGCTGTTTTGACCTCCAT-AGAAGACACCGGGACCGATCCAGCCTCCGCGGCCGGGAACGGTGCA
    Towne  (800) TAGTGAACCGTCAGATCGCCTGGAGACGCCATCCACGCTGTTTTGACCTCCAT-AGAAGACACCGGGACCGATCCAGCCTCCGCGGCCGGGAACGGTGCA
Consensus  (801) TAGTGAACCGTCAGATCGCCTGGAGACGCCATCCACGCTGTTTTGACCTCCAT AGAAGACACCGGGACCGATCCAGCCTCCGCGGCCGGGAACGGTGCA
                 901      ↑                                                                                      1000
     10B2  (899) TTGGAACGCGGATTCCCCGTGCCAAGAGTGACGTAAGTACCGCCTATAGACTCTATAGGCACACCCCTTTGGCT-CTTATGCATGCTATACTGTTTTTGG
     11E2  (890) TTGGAACGCGGATTCCCCGTGCCGAGAGTGACGTAAGTACCGCCTATAGACTCTATAGGCACACCCCTTTGGCT-CTTATGCATGCTATACTGTTTTTGG
     12C9  (889) TTGGAACGC-------------------------------------------------------------------------------------------
     12E1  (847) TTGGAACGCGGATTCCCCGTGCCAAGAGTGACGTAAGTACCGCCTATAGAGTCTATAGGCCCACCCCCTTGGCTTCTTATGCATGCTATACTGTTTTTGG
     12H9  (899) TTGGAACGCGGATTCCCCGTGCCAAGAGTGACGTAAGTACCGCCTATAGACTCTATAGGCACACCCCTTTGGCT-CTTATGCATGCTATACTGTTTTTGG
      3C9  (900) TTGGAACGCGGATTCCCCGTGCCAAGAGTGACGTAAGTACCGCCTATAGACTCTATAGGCACACCCCTTTGGCT-CTTATGCATGCTATACTGTTTTTGG
      4B5  (847) TTGGAACGCGGATTCCCCGTGCCAAGAGTGACGTAAGTACCGCCTATAGACTCTATAGGCACACCCCTTTGGCT-CTTATGCATGCTATACTGTTTTTGG
      6A8  (899) TTGGAACGCGGATTCCCCGTGCCAAGAGTGACGTAAGTACCGCCTATAGACTCTATAGGCACACCCCTTTGGCT-CTTATGCATGCTATACTGTTTTTGG
      6B2  (847) TTGGAACGCGGATTCCCCGTGCCAAGAGTGACGTAAGTACCGCCTATAGACTCTATAGGCACACCCCTTTGGCT-CTTATGCATGCTATACTGTTTTTGG
      6D4  (847) TTGGAACGCGGATTCCCCGTGCCAAGAGTGACGTAAGTACCGCCTATAGAGTCTATAGGCCCACCCCCTTGGCT-CTTATGCATGCTATACTGTTTTTGG
      6F6  (889) TTGGAACGCGGATTCCCCGTGCCAAGAGTGACGTAGGTACCGCCTATAGACTCTATAGGCACACCCCTTTGGCT-CTTATGCATGCTATACTGTTTTTGG
      9E1  (706) TTGGAACGCGGATCCCCCGTGCCAAGAGTGACGTAAGTACCGCCTATAGACTCTATAGGCACACCCCTTTGGCT-CTTATGCATGCTATACTGTTTTTGG
     9F11  (898) TTGGAACGCGGATTCCCCGTGCCAA-AGTGACGTAAGTACCGCCTATAGACTCTATAGGCACACCCCTTTGGCT-CTTATGCATGCTATACTGTTTTTGG
     9G11  (899) TTGGAACGCGGATTCCCCGTGCCAAGAGTGACGTAAGTACCGCCTATAGACTCTATAGGCACACCCCTTTGGCT-CTTATGCATGCTATACTGTTTTTGG
     9G12  (899) TTGGAACGCGGATTCCCCGTGCCAAGAGTGACGTAAGTACCGCCTATAGACTCTATAGGCACACCCCTTTGGCT-CTTATGCATGCTATACTGTTTTTGG
      9G4  (899) TTGGAACGCGGATTCCCCGTGCCAAGAGTGACATAAGTACCGCCTATAGACTCTATAGGCACACCCCTTTGGCT-CTTATGCATGCTATACTGTTTTTGG
      9G7  (889) TTGGAACGCGGATTCCCCGTGCCAAGAGTGACGTAAGTACCGCCTATAGACTCTATAGGCACACCCCTTTGGCT-CTTATGCATGCTATACTGTTTTTGG
      9G8  (899) TTGGAACGCGGATCCCCCGTGCCAAGAGTGACGTAAGTACCGCCTATAGACTCTATAGGCACACCCCTTTGGCT-CTTATGCATGCTATACTGTTTTTGG
    AD169  (898) TTGGAACGCGGATTCCCCGTGCCAAGAGTGACGTAAGTACCGCCTATAGAGTCTATAGGCCCACCCCCTTGGCTTCTTATGCATGCTATACTGTTTTTGG
    Towne  (899) TTGGAACGCGGATTCCCCGTGCCAAGAGTGACGTAAGTACCGCCTATAGACTCTATAGGCACACCCCTTTGGCT-CTTATGCATGCTATACTGTTTTTGG
Consensus  (901) TTGGAACGCGGATTCCCCGTGCCAAGAGTGACGTAAGTACCGCCTATAGACTCTATAGGCACACCCCTTTGGCT CTTATGCATGCTATACTGTTTTTGG
```

Figure 8F: Comparison of 18 chimeric promoter sequences generated by DNA shuffling using CMV promoter nucleic acid sequences from AD169 and Towne human strains and Rhesus and Vervet monkey strains as parental sequences.

```
                    1001                                                                                             1100
     10B2    (998)  CTTGGGGTCTATACACCCCCGCTTCCTTATGCTATAGGTGATGGTATAGCTTAGCCTATAGGTGTGGGTTATTGACCATTATTGACCACTCCCCTATTGG
     11E2    (989)  CTTGGGGCCTATACACCCCCGCTTCCTTATGCTATAGGTGATGGTATAGCTTAGCCTATAGGTGTGGGTTATTGACCATTATTGACCATCCCCCTATTGG
     12C9    (898)  ----------------------------------------------------------------------------------------------------
     12E1    (947)  CTTGGGGTCTATACACCCCCGCTTCCTTATGCTATAGGTGATGGTATAGCTTAGCCTATAGGTGTGGGTTATTGACCATTATTGACCACTCCCCTATTGG
     12H9    (998)  CTTGGGGCCTATACACCCCCGCTTCCTTATGCTATAGGTGATGGTATAGCTTAGCCTATAGGTGTGGGTTATTGACCATTATTGACCACTCCCCTATTGG
      3C9    (999)  CTTGGGGCCTATACACCCCCGCTTCCTTATGCTATAGGTGATGGTATAGCTTAGCCTATAGGTGTGGGTTATTGACCATTATTGACCACTCCCCTATTGG
      4B5    (946)  CTTGGGGCCTATACACCCCCGCTTCCTTATGCTATAGGTGATGGTATAGCTTAGCCTATAGGTGTGGGTTATTGACCATTATTGACCACTCCCCTATTGG
      6A8    (998)  CTTGGGGCCTATACACCCCCGCTTCCTTATGCTATAGGTGATGGTATAGCTTAGCCTATAGGCGTGGGTTATTGACCATTATTGACCACTCCCCTATTGG
      6B2    (946)  CTTGGGGCCTATACACCCCCGCCTCCTTATGCTATAGGTGATGGTATAGCTTAGCCTATAGGTGTGGGTTATTGACCATTATTGACCACTCCCCTATTGG
      6D4    (946)  CTTGGGGCCTATACACCCCCGCTTCCTTATGCTATAGGTGATGGTATAGCTTAGCCTATAGGTGTGGGTTATTGACCATTATTGACCACTCCCCTATTGG
      6F6    (988)  CTTGGGGCCTATACACCCCCGCTTCCTTATGCTATAGGTGATGGTATAGCTTAGCCTATAGGTGTGGGTTATTGACCATTATTGACCACTCCCCTATTGG
      9E1    (805)  CTTGGGGCCTATACACCCCCGCTTCCTTATGCTATAGGTGATGGTATAGCTTAGCCTATAGGTGTGGGTTATTGACCATTATTGACCACTCCCCTATTGG
     9F11    (996)  CTTGGGGCCTATACACCCCCGCTTCCTTATGCTATAGGTGATGGTATAGCTTAGCCTATAGGTGTGGGTTATTGACCATTATTGACCACTCCCCTATTGG
     9G11    (998)  CTTGGGGCCTATACACCCCCGCTTCCTTATGCTATAGGTGATGGTATAGCTTAGCCTATAGGTGTGGGTTATTGACCATTATTGACCACTCCCCTATTGG
     9G12    (998)  CTTGGGGCCTATACACCCCCGCTTCCTTATGCTATAGGTGATGGTATAGCTTAGCCTATAGGTGTGGGTTATTGACCATTATTGACCACTCCCCTATTGG
      9G4    (998)  CTTGGGGCCTATACACCCCCGCTTCCTTATGCTATAGGTGATGGTATAGCTTAGCCTATAGGTGTGGGTTATTGACCATTATTGACCACTCCCCTATTGG
      9G7    (988)  CTTGGGGCCTATACACCCCCGCTTCCTCATGTTATAGGTGATGGTATAGCTTAGCCTATAGGTGTGGGTTATTGACCATTATTGACCATTCCCCTATTGG
      9G8    (998)  CTTGGGGCCTATACACCCCCGCTTCCTTATGCTATAGGTGATGGTATAGCTTAGCCTATAGGTGTGGGTTATTGACCATTATTGACCACTCCCCTATTGG
    AD169    (998)  CTTGGGGTCTATACACCCCCGCTTCCTCATGTTATAGGTGATGGTATAGCTTAGCCTATAGGTGTGGGTTATTGACCATTATTGACCACTCCCCTATTGG
    Towne    (998)  CTTGGGGCCTATACACCCCCGCT-CCTTATGCTATAGGTGATGGTATAGCTTAGCCTATAGGTGTGGGTTATTGACCATTATTGACCACTCCCCTATTGG
Consensus   (1001)  CTTGGGGCCTATACACCCCCGCTTCCTTATGCTATAGGTGATGGTATAGCTTAGCCTATAGGTGTGGGTTATTGACCATTATTGACCACTCCCCTATTGG
                    1101                                                                                             1200
     10B2   (1098)  TGACGATACTTTCCATTACTAATCCATAACATGGCTCTTTGCCACAACTATCTCTATTGGCTATATGCCAATACTCTGTCCTTCAGAGACTGACACGGAC
     11E2   (1089)  TGACGATACTTTCCATTACTAATCCATAACATGGCTCTTTGCCACAGCTATCTCTATTGGCTATATGCCAATACTCTGTCCTTCAGAGACTGACACGGAC
     12C9    (898)  ----------------------------------------------------------------------------------------------------
     12E1   (1047)  TGACGATACTTTCCATTACTAATCCATAACATGGCTCTTTGCCACAACTATCTCTATTGGCTATATGCCAATACACTGTCCTTCAGAGACTGACACGGAC
     12H9   (1098)  TGACGATACTTTCCATTACTAATCCATAACAGGGCTCTTTGCCACAACTATCTCTATTGGCTATATGCCAATACTCTGTCCTTCAGAGACTGACACGGAC
      3C9   (1099)  TGACGATACTTTCCATTACTAATCCATAACATGGCTCTTTGCCACAACTATCTCTATTGGCTATATGCCAATACTCTGTCCTTCAGAGACTGACACGGAC
      4B5   (1046)  TGACGATACTTTCCATTACTAATCCATAACATGGCTCTTTGCCACAACTATCTCTATTGGCTATATGCCAATACTCTGTCCTTCAGAGACTGACACGGAC
      6A8   (1098)  TGACGATACTTTCCATTACTAATCCATAACATGGCTCTTTGCCACAACTATCTCTATTGGCTATATGCCAATACTCTGTCCTTCAGAGACTGACACGGAC
      6B2   (1046)  TGACGATACTTTTCATTACTAATCCATAACATGGCTCTTTGCCACAACTATCTCTATTGGCTATATGCCAATACACTGTCCTTCAGAGACTGACACGGAC
      6D4   (1046)  TGACGATACTTTCCATTACTAATCCATAACATGGCTCTTTGCCACAACTATCTCTATTGGCTATATGCCAATACTCTGTCCTTCAGAGACTGACACGGAC
      6F6   (1088)  TGACGATACTTTCCATTACTAATCCATAACATGGCTCTTTGCCACAACTATCTCTATTGGCTATATGCCAATACTCTGTCCTTCAGAGACTGACACGGAC
      9E1    (905)  TGACGATACTTTCCATTACTAATCCATAACATGGCTCTTTGCCACAACTATCTCTATTGGCTATATGCCAATACTCTGTCCTTCAGAGACTGACACGGAC
     9F11   (1096)  TGACGATACTTTCCATTACTAATCCATAACATGGCTCTTTGCCACAACTATCTCTATTGGCTATATGCCAATACTCTGTCCTTCAGAGACTGACACGGAC
     9G11   (1098)  TGACGATACTTTCCATTACTAATCCATAACATGGCTCTTTGCCACAACTATCTCTATTGGCTATATGCCAATACTCTGTCCTTCAGAGACTGACACGGAC
     9G12   (1098)  TGACGATACTTTCCATTACTAATCCATAACATGGCTCTTTGCCACAACTATCTCTATTGGCTATATGCCAATACTCTGTCCTTCAGAGACTGACACGGAC
      9G4   (1098)  TGACGATACTTTCCATTACTAATCCATAACATGGCTCTTTGCCACAACTATCTCTATTGGCTATATGCCAATACTCTGTCCTTCAGAGACTGACACGGAC
      9G7   (1088)  TGACGATACTTTCCATTACTAATCCATAACATGGCTCTTTGCCACAACTATCTCTATTGGCTATATGCCAATACACTGTCCTTCAGAGGCTGACACGGAC
      9G8   (1098)  TGACGATACTTTCCATTACTAATCCATAACATGGCTCTTTGCCACAACTATCTCTATTGGCTATATGCCAATACTCTGTCCTTCAGAGACTGACACGGAC
    AD169   (1098)  TGACGATACTTTCCATTACTAATCCATAACATGGCTCTTTGCCACAACTCTCTTTATTGGCTATATGCCAATACACTGTCCTTCAGAGACTGACACGGAC
    Towne   (1097)  TGACGATACTTTCCATTACTAATCCATAACATGGCTCTTTGCCACAACTATCTCTATTGGCTATATGCCAATACTCTGTCCTTCAGAGACTGACACGGAC
Consensus   (1101)  TGACGATACTTTCCATTACTAATCCATAACATGGCTCTTTGCCACAACTATCTCTATTGGCTATATGCCAATACTCTGTCCTTCAGAGACTGACACGGAC
```

Figure 8G: Comparison of 18 chimeric promoter sequences generated by DNA shuffling using CMV promoter nucleic acid sequences from AD169 and Towne human strains and Rhesus and Vervet monkey strains as parental sequences.

```
                    1201                                                                                               1300
     10B2  (1198)   TCTGTATTTTTACAGGATGGGGTCCCATTTATTATTTACAAATTCACATATACAACACCACCGTCCCCAGTGCCCGCAGTTTTTGTTAAACATAGCGTGG
     11E2  (1189)   TCTGTATTTTTACAGGATGGGGTCTCATTTATTATTTACAAATTCACATATACAACAACGCCGTCCCCCGTGCCCGCAGTTTTTATTAAACATAGCGTGG
     12C9   (898)   ----------------------------------------------------------------------------------------------------
     12E1  (1147)   TCTGTATTTTTACAGGATGGGGTCCCATTTATTATTTACAAATTCACATATACAACAACGCCGTCCCCCGTGCCCGCAGTTTTTATTAAACATAGCGTGG
     12H9  (1198)   TCTGTATTTTTACAGGATGGGGTCTCATTTATTATTTACAAATTCACATATACAACAACGCCGTCCCCCGTGCCCGCAGTTTTTATTAAACATAGCGTGG
      3C9  (1199)   TCTGTATTTTTACAGGATGGGGTCCCATTTATTATTTACAAATTCACATATACAACACCACCGTCCCCAGTGCCCGCAGTTTTTATTAAACATAGCGTGG
      4B5  (1146)   TCTGTATTTTTACAGGATGGGGTCCCATTTATTATTTACAAATTCACATATACAACAACGCCGTCCCCCGTGCTCGCAGTTTTTATTAAACATAGCGTGG
      6A8  (1198)   TCTGTATTTTTACAGGATGGGGTCCCATTTATTATTTACAAATTCACATATACAACAACGCCGTCCCCCGTGCCCGCAGTTTTTATTAAACATAGCGTGG
      6B2  (1146)   TCTGTATTTTTACAGGATGGGGTCCCATTTATTATTTACAAATTCACATATACAACAACGCCGTCCCCCGTGCCCGCAGTTTTTATTAAACATAACGTGG
      6D4  (1146)   TCTGTATTTTTACAGGATGGGGTCCCATTTATTATTTACAAATTCACATATACAACAACGCCGTCCCCCGTGCCCGCAGTTTTTATTAAACATAGCGTGG
      6F6  (1188)   TCTGTATTTTTACAGGATGGGGTCTCATTTATTATTTACAAATTCACATATACAACAACGCCGTCCCCCGTGCCCGCAGTTTTTATTAAACATAGCGTGG
      9E1  (1005)   TCTGTATTTTTACAGGATGGGGTCCCATTTATTATTTACAAATTCACATATACAACAACGCCGTCCCCCGTGCCCGCAGTTTTTATTAAACATAGCGTGG
     9F11  (1196)   TCTGTATTTTTACAGGATGGGGTCCCATTTATTATTTACAAATTCACATATACAACAACGCCGTCCCCCGTGCCCGCAGTTTTTATTAAACATAGCGTGG
     9G11  (1198)   TCTGTATTTTTACAGGATGGGGTCCCATTTATTATTTACAAATTCACATATACAACAACGCCGTCCCCAGTGCCCGCAGTTTTTATTAAACATAGCGTGG
     9G12  (1198)   TCTGTATTTTTACAGGATGGGGTCTCATTTATTATTTACAAATTCACATATACAACAACGCCGTCCCCCGTGCCCGCAGTTTTTATTAAACATAGCGTGG
      9G4  (1198)   TCTGTATTTTTACAGGATGGGGTCTCATTTATTATTTACAAATTCACATATACAACAACGCCGTCCCCCGTGCCCGCAGTTTTTATTAAACATAGCGTGG
      9G7  (1188)   TCTGTATTTTTACAGGATGGGGTCCCATTTATTATTTACAAATTCACATATACAACAACGCCGTCCCCCGTGCCCGCAGTCTTTATTAAACATAGCGTGG
      9G8  (1198)   TCTGTATTTTTACAGGATGGGGTCCCATTTATTATTTACAAATTCACATATACAACAACGCCGTCCCCAGTGCCCGCAGTTTTTATTAAACATAGCGTGG
    AD169  (1198)   TCTGTATTTTTACAGGATGGGGTCTCATTTATTATTTACAAATTCACATGTACAACACCACCGTCCCCAGTGCCCGCAGTTTTTATTAAACATAACGTGG
    Towne  (1197)   TCTGTATTTTTACAGGATGGGGTCCCATTTATTATTTACAAATTCACATATACAACAACGCCGTCCCCCGTGCCCGCAGTTTTTATTAAACATAGCGTGG
Consensus  (1201)   TCTGTATTTTTACAGGATGGGGTCCCATTTATTATTTACAAATTCACATATACAACAACGCCGTCCCCCGTGCCCGCAGTTTTTATTAAACATAGCGTGG
                    1301                                                                                               1400
     10B2  (1298)   GATCTCCACGCAAATCTCGGGTACGTGTTCCGGACATGGGCTCTTCTCCGGTAGCGGCGGAGCTTCCACATCCGAGCCCTGGTCCCATGCCTCCAGCGGC
     11E2  (1289)   GATCTCCACGCGAATCTCGGGTACGTGTTCCGGACATGGGCTCTTCTCCGGTAGGGGCGGAGCTTCCACATCCGAGCCCTGGTCCCATGCCTCCAGCGGC
     12C9   (898)   ----------------------------------------------------------------------------------------------------
     12E1  (1247)   GATCTCCACGCGAATCTCGGGTACGTGATCCGGACATGGGCTCTTCTCCGGTAGCGGTGGAGCTTCCACATCCGAGCCCTGGTCCCATGCCTCCAGCGGC
     12H9  (1298)   GATCTCCACGCGAATCTCGGGTACGTGTTCCGGACATGGGCTCTTCTCCGGTAGCGGTGGAGCTTCCACATCCGAGCCCTGGTCCCATGCCTCCAGCGGC
      3C9  (1299)   GATCTCCACGCGAATCTCGGGTACGTGTTCCGGACATGGGCTCTTCTCCGGTAGGGGCGGAGCTTCCACATCCGAGCCCTGGTCCCATGCCTCCAGCGGC
      4B5  (1246)   GATCTCCACGCGAATCTCGGGTACGTGTTCCGGACATGGGCTCTTCTCCGGTAGGGGCGGAGCTTCCACATCCGAGCCCTGGTCCCATGCCTCCAGCGGC
      6A8  (1298)   GATCTCCACGCGAATCTCGGGTACGTGTTCCGGACATGGGCTCTTCTCCGGTAGCGGTGGGGCTTCCACATCCGAGCCCTGGTCCCATGCCTCCAGCGAC
      6B2  (1246)   GATCTCCACGCGAATCTCGGGTACGTGTTCCGGACATGGGCTCTTCTCCGGTAGCGGCGGAGCTTCCACATCCGAGCCCTGCTCCCATGCCTCCAGCGGC
      6D4  (1246)   GATCTCCACGCGAATCTCGGGTACGTGTTCCGGACATGGGCTCTTCTCCGGTAGCGGCGGAGCTTCCACATCCGAGCCCTGGTCCCATGCCTCCAGCGGC
      6F6  (1288)   GATCTCCACGCGAATCTCGGGTACGTGTTCCGGACATGGGCTCTTCTCCGGTAGCGGCGGAGCTTCCACATCCGAGCCCTGGTCCCATGCCTCCAGCGGC
      9E1  (1105)   GATCTCCACGCGAATCTCGGGTACGTGTTCCGGACATGGGCTCTTCTCCGGTAGCGGCGGAGCTTCCACATCCGAGCCCTGGTCCCATGCCTCCAGCGGC
     9F11  (1296)   GATCTCCACGCGAATCTCGGGTACGTGTTCCGGACATGGGCTCTTCTCCGGTAGCGGCGGAGCTTCCACATCCGAGCCCTGGTCCCATGCCTCCAGCGGC
     9G11  (1298)   GATCTCCACGCGAATCTCGGGTACGTGTTCCGGACATGGGCTCTTCTCCGGTAGGGGCGGAGCTTCCACATCCGAGCCCTGCTCCCATGCCTCCAGCGGC
     9G12  (1298)   GATCTCCACGCGAATCTCGGGTACGTGTTCCGGACATGGGCTCTTCTCCGGTAGCGGCGGAGCTTCCACATCCGAGCCCTGGTCCCATGCCTCCAGCGGC
      9G4  (1298)   GATCTCCACGCAAATCTCGGGTACGTGTTCCGGGCATGGGCTCTTCTCCGGTAGCGGCGGAGCTTCCACATCCGAGCCCTGGTCCCATGCCTCCAGCGGC
      9G7  (1288)   GATCTCCACGCGAATCTCGGGTACGTGTTCCGGACATGGGCTCTTCTCCGGTAGCGGCGGAGCTTCCACATCCGAGCCCTGGTCCCATGCCTCCAGCGGC
      9G8  (1298)   GATCTCCACGCGAATCTCGGGTACGTGTTCCGGACATGGGCTCTTCTCCGGTAGCGGCGGAGCTTCCACATCCGAGCCCTGGTCCCATGCCTCCAGCGGC
    AD169  (1298)   GATCTCCACGCGAATCTCGGGTACGTGTTCCGGACATGGGCTCTTCTCCGGTAGCGGCGGAGCTTCTACATCCGAGCCCTGCTCCCATGCCTCCAGCGAC
    Towne  (1297)   GATCTCCACGCGAATCTCGGGTACGTGTTCCGGACATGGGCTCTTCTCCGGTAGCGGCGGAGCTTCCACATCCGAGCCCTGGTCCCATGCCTCCAGCGGC
Consensus  (1301)   GATCTCCACGCGAATCTCGGGTACGTGTTCCGGACATGGGCTCTTCTCCGGTAGCGGCGGAGCTTCCACATCCGAGCCCTGGTCCCATGCCTCCAGCGGC
```

Figure 8H: Comparison of 18 chimeric promoter sequences generated by DNA shuffling using CMV promoter nucleic acid sequences from AD169 and Towne human strains and Rhesus and Vervet monkey strains as parental sequences.

```
                     1401                                                                                           1500
     10B2   (1398)   TCATGGTCGCTCGGCAGCTCCTTGCTCCTAACAGTGGAGGCCAGACTTAGGCACAGCACAATGCCCACCACCACCAGTGTGCCGCACAAGGCCGTGGCGG
     11E2   (1389)   TCATGGTCGCTCGGCAGCTCCTTGCTCCTAACAGTGGAGGCCAGACTTAGGCACAGCACAATGCCCACCACCACCAGTGTGCCGCACAAGGCCGTGGCGG
     12C9    (898)   ----------------------------------------------------------------------------------------------------
     12E1   (1347)   TCATGGTCGCTCGGCAGCTCCTTGCTCCTAACAGTGGAGGCCAGACTTATGCACAGCACAATGCCCACCACCACCAGTGTGCCGCACAAGGCCGTGGCGG
     12H9   (1398)   TCATGGTCGCTCGGCAGCTCCTTGCTCCTAACAGTGGAGGCCAGACTTATGCACAGCACAATGCCCACCACCACCAGTGTGCCGCACAAGGCCGTGGCGG
      3C9   (1399)   TCATGGTCGCTCGGCAGCTCCTCGCTCCTAACAGTGGAGGCCAGACTTAGGCACAGCACAATGCCCACCACCACCAGTGTGCCGCACAAGGCCGTGGCGG
      4B5   (1346)   TCATGGTCGCTCGGCAGCTCCTTGCTCCTAACAGTGGAGGCCAGACTTAGGCACAGCACGATGCCCACCACCACCAGTGTGCCGCACAAGGCCGTGGCGG
      6A8   (1398)   TCATGGTCGCTCGGCAGCTCCTTGCTCCCAACAGTGGAGGCCAGACTTAGGCACAGCACGATGCCCACCACCACCAGTGTGCCGCACAAGGCCGTGGCGG
      6B2   (1346)   TCATGGTCGCTCGGCAGCTCCTTGCTCCTAACAGTGGAGGCCAGACTTAGGCACAGCACAATGCCCACCACCACCAGTGTGCCGCACAAGGCCGTGGCGG
      6D4   (1346)   TCATGGTCGCTCGGCAGCTCCTTGCTCCCAACAGTGGAGGCCAGACTTAGGCACAGCACAATGCCCACCACCACCAGTGTGCCGCACAAGGCCGTGGCGG
      6F6   (1388)   TCATGGTCGCTCGGCAGCCCCTTGCTCCTAACAGTGGAGGCCAGACTTAGGCACAGCACAATGCCCACCACCACCAGTGTGCCGCACAAGGCCGTGGCGG
      9E1   (1205)   TCATGGTCGCTCGGCAGCTCCTTGCTCCTAACAGTGGAGGCCAGACTTAGGCGCAGCACAATGCCCACCACCACCAGTGTGCCGCACAAGGCCGTGGCGG
     9F11   (1396)   TCATGGTCGCTCGGCAGCTCCTTGCTCCTAACAGTGGAGGCCAGACTTAGGCGCAGCACAATGCCCACCACCACCAGTGTGCCGCACAAGGCCGTGGCGG
     9G11   (1398)   TCATGGTCGCTCGGCAGCTCCTTGCTCCTAACAGTGGAGGCCAGACTTAGGCACAGCACAATGCCCACCACCACCAGTGTGCCGCACAAGGCCGTGGCGG
     9G12   (1398)   TCATGGTCGCTCGGCAGCTCCTTGCTCCTAACAGTGGAGGCCAGACTTAGGCACAGCACAATGCCCACCACCACCAGTGTGCCGCACAAGGCCGTGGCGG
      9G4   (1398)   TCATGGTCGCTCGGCAGCTCCTTGCTCCTAACAGTGGAGGCCAGACTTAGGCACAGCACAATGCCCACCACCACCAGTGTGCCGCACAAGGCCGTGGCGG
      9G7   (1388)   TCATGGTCGCTCGGCAGCTCCTTGCTCCTAACAGTGGAGGCCAGACTTAGGCACAGCACAATGCCCACCACCACCAGTGTGCCGCACAAGGCCGTGGCGG
      9G8   (1398)   TCATGGTCGCTCGGCAGCTCCTTGCTCCTAACAGTGGAGGCCAGACTTAGGCACAGCACAATGCCCACCACCACCAGTGTGCCGCACAAGGCCGTGGCGG
    AD169   (1398)   TCATGGTCGCTCGGCAGCTCCTTGCTCCTAACAGTGGAGGCCAGACTTAGGCACAGCACGATGCCCACCACCACCAGTGTGCCGCACAAGGCCGTGGCGG
    Towne   (1397)   TCATGGTCGCTCGGCAGCTCCTTGCTCCTAACAGTGGAGGCCAGACTTAGGCACAGCACAATGCCCACCACCACCAGTGTGCCGCACAAGGCCGTGGCGG
Consensus   (1401)   TCATGGTCGCTCGGCAGCTCCTTGCTCCTAACAGTGGAGGCCAGACTTAGGCACAGCACAATGCCCACCACCACCAGTGTGCCGCACAAGGCCGTGGCGG
                     1501                                                                                           1600
     10B2   (1498)   TAGGGTATGTGTCTGAAAATGAGCTCGGAGATTGGGCTCGCACCGCTGACGCAGATGGAAGACTTAAGGCAGCGGCAGAAGAAGATGCAGGCAGCTGAGT
     11E2   (1489)   TAGGGTATGTGTCTGAAAATGAGCTCGGAGCTTGGGCTCGCACCGCTGACGCAGATGGAAGACTTAAGGCAGCGGCAGAAGAAGATGCAGGCAGCTGAGT
     12C9    (898)   ----------------------------------------------------------------------------------------------------
     12E1   (1447)   TAGGGTATGTGTCTGAAAATGAGCTCGGAGATTGGGCTCGCACCGCTGACGCAGATGGAAGACTTAAGGCAGCGGCAGAAGAAGATGCAGGCAGCTGAGT
     12H9   (1498)   TAGGGTATGTGTCTGAAAATGAGCTCGGGGAGCGGGCTTGCACCGCTGACGCAGATGGAAGACTTAAGGCAGCGGCAGAAGAAGATGCAGGCAGCTGAGT
      3C9   (1499)   TAGGGTATGTGTCTGAAAATGAGCTCGG--AGTGGGCTTGCACCGCTGACGCATTTGGAAGACTTAAGGCAGCGGCAGAAGAAGATGCAGGCAGCTGAGT
      4B5   (1446)   TAGGGTATGTGTCTGAAAATGAGCTCGGAGATTGGGCTCGCACCGCTGACGCAGATGGAAGACTTAAGGCAGCGGCAGAAGAAGATGCAGGCAGCTGAGT
      6A8   (1498)   TAGGGTATGTGTCTGAAAATGAGCTCGGAGATCGGGCTCGCACCGCTGACGCAGATGGAAGACTTAAGGCAGCGGCAGAAGAAGACGCAGGCAGCTGAGT
      6B2   (1446)   TAGGGTATGTGTCTGAAAATGAGCTCGGAGATTGGGCTCGCACCGCTGACGCAGATGGAAGACTTAAGGCAGCGGCAGAGGAAGATGCAGGCAGCTGAGT
      6D4   (1446)   TAGGGTATGTGTCTGAAAATGAGCTCGGAGATTGGGCTCGCACCGCTGACGCAGATGGAAGACTTAAGGCAGCGGCAGAAGAAGATGCAGGCAGCTGAGT
      6F6   (1488)   TAGGGTATGTGTCTGAAAATGAGCTCGGAGATTGGGCTCGCACCGCTGACGCAGATGGAAGACTTAAGGCAGCGGCAGAAGAGGATGCAGGCAGCTGAGT
      9E1   (1305)   TAGGGTATGTGTCTGAAAATGAGCTCGGAGATTGGGCTCGCACCGCTGACGCAGATGGAAGACTTAAGGCAGCGGCAGAAGAAGATGCAGGCAGCTGAGT
     9F11   (1496)   TAGGGTATGTGTCTGAAAATGAGCTCGGAGATTGGGCTCGCACCGCTGACGCAGATGGAAGACTTAAGGCAGCGGCAGAAGAAGATGCAGGCAGCTGAGT
     9G11   (1498)   TAGGGTATGTGTCTGAAAATGAGCTCGGAGATTGGGCTCGCACCGCTGACGCAGATGGAAGACTTAAGGCAGCGGCAGAAGAAGATGCAGGCAGCTGAGT
     9G12   (1498)   TAGGGTATGTGTCTGAAAATGAGCTCGGGGAGCGGGCTTGCACCGCTGACGCAGATGGAAGACTTAAGGCAGCGGCAGAAGAAGATGCAGGCAGCTGAGT
      9G4   (1498)   TAGGGTATGTGTCTGAAAATGAGCTCGGAGATTGGGCTCGCACCGCTGACGCAGATGGAAGACTTAAGGCAGCGGCAGAAGAAGATGCAGGCAGCTGAGT
      9G7   (1488)   TAGGGTATGTGTCTGAAAATGAGCTCGGAGATTGGGCTCGCACCGCTGACGCAGATGGAAGACTTAAGGCAGCGGCAGAAGAAGATGCAGGCAGCTGAGT
      9G8   (1498)   TAGGGTATGTGTCTGAAAATGAGCTCGGAGATCGGGCTCGCACCGCTGACGCAGATGGAAGACTTAAGGCAGCGGCAGAAGAAGATGCAGGCAGCTGAGT
    AD169   (1498)   TAGGGTATGTGTCTGAAAATGAGCTCGGGGAGCGGGCTTGCACCGCTGACGCATTTGGAAGACTTAAGGCAGCGGCAGAAGAAGATGCAGGCAGCTGAGT
    Towne   (1497)   TAGGGTATGTGTCTGAAAATGAGCTCGGAGATTGGGCTCGCACCG-TGACGCAGATGGAAGACTTAAGGCAGCGGCAGAAGAAGATGCAGGCAGCTGAGT
Consensus   (1501)   TAGGGTATGTGTCTGAAAATGAGCTCGGAGATTGGGCTCGCACCGCTGACGCAGATGGAAGACTTAAGGCAGCGGCAGAAGAAGATGCAGGCAGCTGAGT
```

Figure 8I: Comparison of 18 chimeric promoter sequences generated by DNA shuffling using CMV promoter nucleic acid sequences from AD169 and Towne human strains and Rhesus and Vervet monkey strains as parental sequences.

```
                   1601                                                                                              1700
     10B2   (1598) TGTTGTATTCTGATAAGAGTCAGAGGTAACTCCCGTTGCGGTGCTGTTAACGGTGGAGGGCAGTGTAGTCTGAGCAGTACTCGTTGCTGCCGCGCGCGCC
     11E2   (1589) TGTTGTATTCTGATAAGAGTCAGAGGTAACTCCCGTTGCGGTGCTGTTAACGGTGGAGGGCAGTGTAGTCTGAGCAGTACTCGTTGCTGCCGCGCGCGCC
     12C9    (898) ----------------------------------------------------------------------------------------------------
     12E1   (1547) TGTTGTATTCTGATAAGAGTCAGAGGTAACTCCCGTTGCGGTGCTGTTAACGGTGGAGGGCAGTGTAGTCTGAGCAGTACTCGTTGCTGCCGCGCGCGCC
     12H9   (1598) TGTTGTATTCTGATAAGAGTCAGAGGTAACTCCCGTTGCGGTGCTGTTAACGGTGGAGGGCAGTGTAGTCTGAGCAGTACTCGTTGCTGCCGCGCGCGCC
      3C9   (1597) TGTTGTGTTCTGATAAGAGTCAGAGGTAACTCCCGTTGCGGTGCCGTTAACGGTGGAGGGCAGTGTAGTCTGAGCAGTACTCGTTGCTGCCGCGCGCGCC
      4B5   (1546) TGTTGTATTCTGATAAGAGTCAGAGGTAACTCCCGTTGCGGTGCTGTTAACGGTGGAGGGCAGTGTAGTCTGAGCAGTACTCGTTGCTGCCGCGCGCGCC
      6A8   (1598) TGTTGTGTTCTGATAAGAGTCAGAGGTAACTCCCGTTGCGGTGCTGTTAACGGTGGAGGGCAGTGTAGTCTGAGCAGTACTCGTTGCTGCCGCGCGCGCC
      6B2   (1546) TGTTGTGTTCTGATAAGAGTCAGAGGTAACTCCCGTTGCGGTGCTGTTAACGGTGGAGGGCAGTGTAGTCTGAGCAGTACTCGTTGCTGCCGCGCGCGCC
      6D4   (1546) TGTTGTATTCTGATAAGAGTCAGAGGTAACTCCCGTTGCGGTGCTGTTAACGGTGGAGGGCAGTGTAGTCTGAGCAGTGCTCGTTGCTGCCGCGCGCGCC
      6F6   (1588) TGTTGTATTCTGATAAGAGTCAGAGGTAACTCCCGTTGCGGTGCTGTTAACGGTGGAGGGCAGTGTAGTCTGAGCAGTACTCGTTGCTGCCGCGCGCGCC
      9E1   (1405) TGTTGTATTCTGATAAGAGTCAGAGGTAACTCCCGTTGCGGTGCTGTTAACGGTGGAGGGCAGTGTAGTCTGAGCAGTACTCGTTGCTGCCGCGCGCGCC
     9F11   (1596) TGTTGTATTCTGATAAGAGTCAGAGGTAACTCCCGTTGCGGTGCTGTTAACGGTGGAGGGCAGTGTAGTCTGAGCAGTACTCGTTGCTGCCGCGCGCGCC
     9G11   (1598) TGTTGTATTCTGATAAGAGTCAGAGGTAGCTCCCGTTGCGGTGCTGTTAACGGTGGAGGGCAGTGTAGTCTGAGCAGTACTCGTTGCTGCCGCGCGCGCC
     9G12   (1598) TGTTGTATTCTGATAAGAGTCAGAGGTAACTCCCGTTGCGGTGCTGTTAACGGTGGAGGGCAATGTAGTCTGAGCAGTACTCGTTGCTGCCGCGCGCGCC
      9G4   (1598) TGTTGTATTCTGATAAGAGTCAGAGGTAACTCCCGTTGCGGTGCTGTTAACGGCGGAGGGCAGTGTAGTCTGAGCAGTACTCGTTGCTGCCGCGCGCGCC
      9G7   (1588) TGTTGTATTCTGATAAGAGTCAGAGGTAACTCCCGTTGCGGTGCTGTTAACGGTGGAGGGCGGTGTAGTCTGAGCAGTACTCGTTGCTGCCGCGCGCGCC
      9G8   (1598) TGTTGTATTCTGATAAGAGTCAGAGGTAACTCCCGTTGCGGTGCTGTTAACGGTGGAGGGCAGTGTAGTCTGAGCAGTGCTCGTTGCTGCCGCGCGCGCC
    AD169   (1598) TGTTGTGTTCTGATAAGAGTCAGAGGTAACTCCCGTTGCGGTGCTGTTAACGGTGGAGGGCAGTGTAGTCTGAGCAGTACTCGTTGCTGCCGCGCGCGCC
    Towne   (1596) TGTTGTATTCTGATAAGAGTCAGAGGTAACTCCCGTTGCGGTGCTGTTAACGGTGGAGGGCAGTGTAGTCTGAGCAGTACTCGTTGCTGCCGCGCGCGCC
Consensus   (1601) TGTTGTATTCTGATAAGAGTCAGAGGTAACTCCCGTTGCGGTGCTGTTAACGGTGGAGGGCAGTGTAGTCTGAGCAGTACTCGTTGCTGCCGCGCGCGCC
                   1701                                                                  1770
     10B2   (1698) ACCAGACATAATAGCTGACAGACTAACAGACTGTTCCTTTCCATGGGTCTTTTCTGCAGTCACCGTCCTT
     11E2   (1689) ACCAGACATAATAGCTGACAGACTAACAGACTGTTCCTTTCCATGGGTCTTTTCTGCAGTCACCGTCCTT
     12C9    (898) ----------------------------------------------------------------------
     12E1   (1647) ACCAGACATAATAGCTGACAGACTAACAGACTGTTCCTTTCCATGGGTCTTTTCTGCAGTCACCGTCCTT
     12H9   (1698) ACCAGACATAATAGCTGACAGACTAACAGACTGTTCCTTTCCATGGGTCTTTTCTGCAGTCACCGTCCTT
      3C9   (1697) ACCAGACATAATAGCTGACAGACTAACAGACTGTTCCTTTCCATGGGTCTTTTCTGCAGTCACCGTCCTT
      4B5   (1646) ACCAGACATAATAGCTGACAGACTAACAGACTGTTCCTTTCCATGGGTCTTTTCTGCAGTCACCGTCCTT
      6A8   (1698) ACCAGACATAATAGCTGACAGACTAACGGACTGTTCCTTTCCATGGGTCTTTTCTGCAGTCACCGTCCTT
      6B2   (1646) ACCAGACATAATAGCTGACAGACTAACAGACTGTTCCTTTCCATGGGTCTTTTCTGCAGTCACCGTCTT-
      6D4   (1646) ACCAGACATAATAGCTGACAGACTAACAGGCTGTTCCTTTTCATGGGTCTTTTCTGCAGTCACCGTCCTT
      6F6   (1688) ACCAAACATAATAGCTGACAGACTAACAGACTGTTCCTTTCCATGGGTCTTTTCTGCAGTCACCGTCCTT
      9E1   (1505) ACCAGACATAATAGCTGACAGACTAACAGACTGTTCCTTTCCATGGGTCTTTTCTGCAGTCACCGTCCTT
     9F11   (1696) ACCAGACATAATAGCTGACAGACTAACAGACTGTTCCTTTCCATGGGTCTTTTCTGCAGTCACCGTCCTT
     9G11   (1698) ACCAGACATAATAGCTGACAGACTAACAGACTGTTCCTTTCCATGGGTCTTTTCTGCAGTCACCGTCCTT
     9G12   (1698) ACCAGACATAATAGCTGACAGACTAACAGACTGTTCCTTTCCATGGGTCTTTTCTGCAGTCACCGTCCTT
      9G4   (1698) ACCAGACATAATAGCTGACAGACTAACAGACTGTTCCTTTCCATGGGTCTTTTCTGCAGTCACCGTCCTT
      9G7   (1688) ACCAGACATAATAGCTGACAGACTAACAGACTGTTCCTTTCCATGGGTCTTTTCTGCAGTCACCGTCCTT
      9G8   (1698) ACCAGACATAATAGCTGACAGACTAACAGGCTGTTCCTTTTCATGGGTCTTTTCTGCAGTCACCGTCCTT
    AD169   (1698) ACCAGACATAATAGCTGACAGACTAACAGACTGTTCCTTTCCATGGGTCTTTTCTGCAGTCACCGTCCTT
    Towne   (1696) ACCAGACATAATAGCTGACAGACTAACAGACTGTTCCTTTCCATGGGTCTTTTCTGCAGTCACCGTCCTT
Consensus   (1701) ACCAGACATAATAGCTGACAGACTAACAGACTGTTCCTTTCCATGGGTCTTTTCTGCAGTCACCGTCCTT
```

FIGURE 9

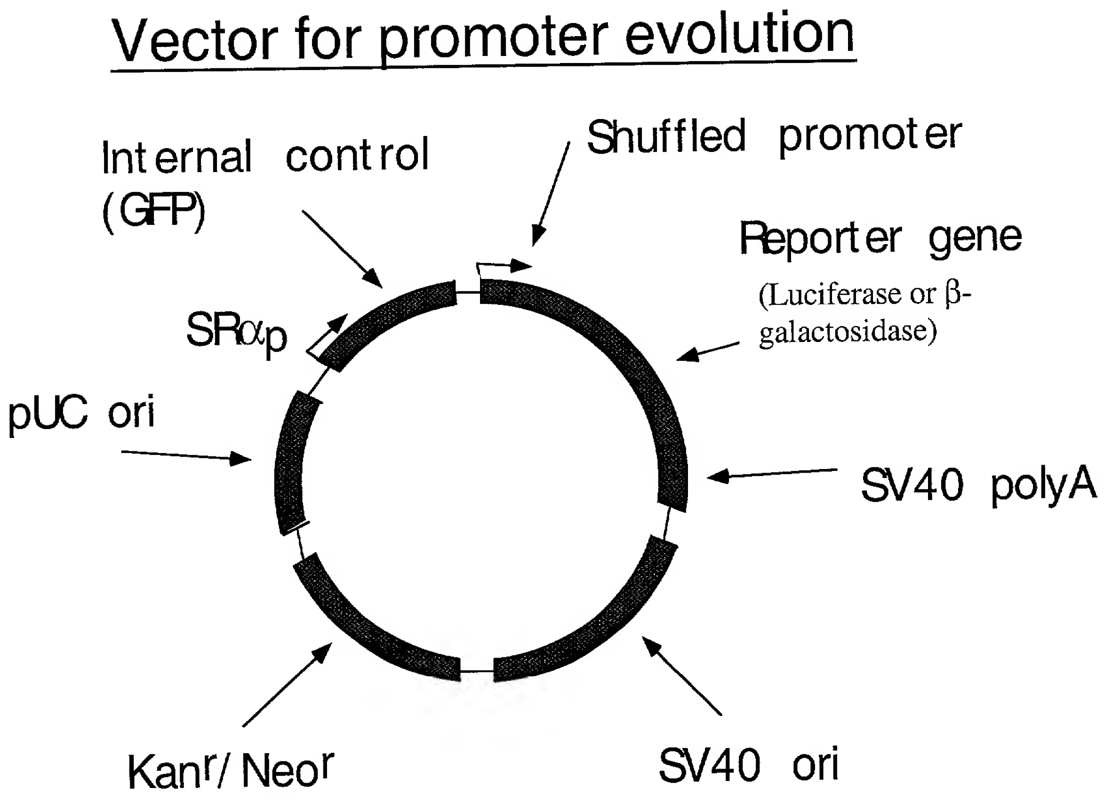
Vector for promoter evolution
Internal control
(GFP)
Shuffled promoter
Reporter gene
(Luciferase or β-galactosidase)
SRαp
pUC ori
SV40 polyA
Kanr/ Neor
SV40 ori

FIGURE 10A

```
                                   1                                                         60
   Towne_promoter_fr_PCR_prod_seq  ATA....TGAGGCTATATCGCCGATAGAGGCGACATCAAGCTGGCACATGGCCAATGCAT
     Rhesus_monkey_PCR_prod_821bp  ACT....TGGCACGGTGCCAA.GTTTGGGGCGGGTC...TTGGCACCGTGCCAA.....
Vervet_(Simian)_PCR_product_seq  ATTGAATTGGCATGGTGCCAATAATGGCGGC..CATA...TTGGCTATATGCCA......

                                   61                                                       120
   Towne_promoter_fr_PCR_prod_seq  ATCGATCTATACATTGAATCAATATTGGCAATTAGCCATATTAGTCATTGGTTATATAGC
     Rhesus_monkey_PCR_prod_821bp  ...GTCCGCCATATTGGTTTGGCAT.....ATGTCCAATATTATTGAT...CCATATAGC
Vervet_(Simian)_PCR_product_seq  ...............GGATCAATAT.....ATAGGCAATATC.........CAATATGGC

                                   121                                                      180
   Towne_promoter_fr_PCR_prod_seq  ATAAATCAATATTGGCTATTGGCCATTGCATACGTTGTATCTATATCATAATATGTACAT
     Rhesus_monkey_PCR_prod_821bp  CAATATCCAATATGGCTAATAGCCA...........GGTTCAATAGAATGGCCAATAAGC
Vervet_(Simian)_PCR_product_seq  CCTATGCCAATATGGCTATTGGCCA...........GGTTCAATACTATGTATTGGCCCT

                                   181                                                      240
   Towne_promoter_fr_PCR_prod_seq  TTATATTGGCTCATGTCCAATATGACCGCCATGTTGACATTGATTATTGACTAGTT..AT
     Rhesus_monkey_PCR_prod_821bp  CAATAT..GCCATTGGCCAACATGGCAA.TGGGCCAGTATTGATTATAGCCAATAT..AT
Vervet_(Simian)_PCR_product_seq  ATGCCA..TATAGTATTCCATATATGGGTTTTCCTATTGACGTAGATAGCCCCTCCCAAT
```

FIGURE 10B

```
                                   241                                                         300
   Towne_promoter_fr_PCR_prod_seq  TAATAGTA......ATCAATTACGGGGTCATTAGTTCATAGCCCATATATGGAGTTCCGC
     Rhesus_monkey_PCR_prod_821bp  AGGCAATA......ATCCATATTGG...CATATGTCCATATTGCCTATAGCCATATTGGC
Vervet_(Simian)_PCR_product_seq  GGGCGGTCCCATATACCATATATGG...GGCTTCCTAATACCGCCCATAGCCACTCCCCC

                                   301                                                         360
   Towne_promoter_fr_PCR_prod_seq  GT...T..ACATAACTTACGGTAAATGGCCCGCCTCGTGACCGCCCAACGACCCCCGCCC
     Rhesus_monkey_PCR_prod_821bp  TTATGT..CCATTACCAATACCATATATGGGTCTTCCTATATACGTCATAGGTACCGCCC
Vervet_(Simian)_PCR_product_seq  AT...TGACGTCAATGGTCTCTATATATGGTCTTTCCTATTGACGTCATATGGGCGGTCC

                                   361                                                         420
   Towne_promoter_fr_PCR_prod_seq  .ATTGACGT................................................CAA
     Rhesus_monkey_PCR_prod_821bp  .ATTGACGTAATATGGATACGCCTCCATTGACGTCAATGGGAGGGATTAATATACGTCAC
Vervet_(Simian)_PCR_product_seq  TATTGACGTA.TATGGCGCCTCCCCCATTGACGTCAATTACGGTAAATGGCCCGCCTGGC

                                   421                                                         480
   Towne_promoter_fr_PCR_prod_seq  TAATGACGTATGTTCCCAT...............AGTAACGCCAATAGGG..ACTTTCCA
     Rhesus_monkey_PCR_prod_821bp  TAATACCGCCCATTGACGTGTATAGGACCGTCCCATTGACGTCAATAGGCCCACCTCCCA
Vervet_(Simian)_PCR_product_seq  T..CAATGCCCATTGACGT.......................CAATAGGACCACCCACCA
```

FIGURE 10C

```
                                   481                                                        540
   Towne_promoter_fr_PCR_prod_seq  TTGACGTCAATGGGTGGAGTATTTACGGTAAACTGCCCACTT..........GGCAGTAC
     Rhesus_monkey_PCR_prod_821bp  TTGACGTCAATGGG..........GTGGCCCATTGCCCATTC..................
  Vervet_(Simian)_PCR_product_seq  TTGACGTCAATGGG..........ATGGCTCATTGCCCATTCATATCCGTTC........

                                   541                                                        600
   Towne_promoter_fr_PCR_prod_seq  ATCAAGTGTATCATATGCCAAGTCCGGCCCCCTATTGACGTCAATGACGGTAAATGGCCC
     Rhesus_monkey_PCR_prod_821bp  ......................CCACGCCCCCTATTGACGTCAATGACGGTAAATGGCC.
  Vervet_(Simian)_PCR_product_seq  ......................TCACGCCCCCTATTGACGTCAATGACGGTAAATGGCC.

                                   601                                                        660
   Towne_promoter_fr_PCR_prod_seq  GCCTGGCATTATGCCCAGTACATGACCTTACGGGACTTTCCTACTTGGCAGTACATC..T
     Rhesus_monkey_PCR_prod_821bp  .........................................CACTTGGCAGTACATCAAT
  Vervet_(Simian)_PCR_product_seq  .........................................CACTTGGCAGTACATCAAT

                                   661                                                        720
   Towne_promoter_fr_PCR_prod_seq  ACGTATTAGTCATCGCTATTACCATGGTGATGCGGTTTTGGCAGTACACCAA........
     Rhesus_monkey_PCR_prod_821bp  ACCTATTAATAGTAACT..TGGCAAGTAAATGGGTACTTGGCAGTACACCAAGG.TACAT
  Vervet_(Simian)_PCR_product_seq  ATCTATTAATAGTAACT..TGGCAAGTACATTACTATTGGCAAGTACGCCAAGGGTACAT
```

FIGURE 10D

```
                                   721                                                         780
  Towne_promoter_fr_PCR_prod_seq   ...............TGGGCGTGGATAGCGGT..TTGACTCACGGGGATTTCCAAGTCTC
    Rhesus_monkey_PCR_prod_821bp   TGGCAG.TACTCCCATTGACGTCAATGGCGGTAAATGGCCCGCAATGGCTGCCAAGTACA
Vervet_(Simian)_PCR_product_seq    TGGCAGGTACTCCCATTGACGTCAATGGCGGTAAATGGCCCGGCATGGCTGCCAAGTACA

                                   781                                                         840
  Towne_promoter_fr_PCR_prod_seq   ...CACCCCATTGACGTCAATGGGAGTTTGTTTTGGCACCAAAATCAACGGGACTTTCCA
    Rhesus_monkey_PCR_prod_821bp   ...TGCCC.ATTGACGTCAATGGGG....................................
Vervet_(Simian)_PCR_product_seq    ACATCCCC.ATTGACGTCAATGGGAA..................................

                                   841                                                         900
  Towne_promoter_fr_PCR_prod_seq   AAATGTCGTAATAACCCCGCCCCGTTGACGCAAATGGGCG....................
    Rhesus_monkey_PCR_prod_821bp   .................CGGTCCTATGACGTCAATGGGCG....................
Vervet_(Simian)_PCR_product_seq    ..................GGGGCAATGACGCAAATGGGCGTTCCATTGACGTAAATGGCG

                                   901                                                         960
  Towne_promoter_fr_PCR_prod_seq   GTAGGCGTGTACGGTGGGAGGTCTATATAAGCAGAGCTCGTTTAGTGAACCGTCAGATCG
    Rhesus_monkey_PCR_prod_821bp   GTAGGCGTGC.CTATGGGCGGTCTATATAAGCAATGCACGTTTAGGGAACCGCCATTCTG
Vervet_(Simian)_PCR_product_seq    GTAGGCGTGCCTAATGGGAGGTCTATATAAGCAATGCTCGTTTAGGGAACCGCCATTCTG
```

FIGURE 10E

```
                                  961                                                        1020
 Towne_promoter_fr_PCR_prod_seq   CCTGGAGACGCCATCCACGCTGTTTTGACCTCCAT.AGAAGACACCGGG.ACCGATCCAG
   Rhesus_monkey_PCR_prod_821bp   CCTGGGGACGTCG..........GAGGAGCACCAT.AGAAGGTACCGGGGACCGATCCAG
Vervet_(Simian)_PCR_product_seq   CCTGGGGACGTCG..........GAGGAGCTCCATTGGAAGAGACCGGG.ACCGATCCAG

                                  1021                                 1057
 Towne_promoter_fr_PCR_prod_seq   CCTCCGCGGCCGGGAACGGTGCATTGGAACGCGGATT            SEQ ID NO:20
   Rhesus_monkey_PCR_prod_821bp   CCTCCATAGCCGGGAAGGGTGCATTGGAACGCGGATA            SEQ ID NO:22
Vervet_(Simian)_PCR_product_seq   CCTCCATAGCCGGGGACGGTGCATTGGAATGCGGATA            SEQ ID NO:23
```